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A BRITISH ILLUMINATING ENGINEERING SOCIETY.

We are glad to note that steps have been taken toward the formation of an active British society devoted to illuminating engineering. There has been a great deal of activity in practical illumination among our British confrères. London is at present, in fact, a gigantic station for the trial of new illuminants, and there exists a good reason for the organization of those interested in pushing along the cause of practical illumination. The same objections raised here three years ago are heard in London—that illumination is not an art at all, but a trade; that nobody wants the services of a specialist to tell him about things he already knows; that an illuminating engineer is nothing but an electrical engineer with a little common sense, etc. These various protests are now merely cause for smiling, for the new profession has proved already its right to be taken seriously, and its capability for good. The past three years have shown progress in good lighting to an extent that was hardly imaginable at the beginning of the period. And it is but the beginning of future improvements. The story of the British society will be a very similar one, and in it will be brought together as here the most diverse interests working together for a common end. In spite of predictions to the contrary, gas engineers and electrical engineers will join hands, there as here, if not with rivalry forgotten, at least with cordial good will and interest.

The fact is that illuminating engineering requires a deal of specialized knowledge that does not lie within the natural field of any other branch of engineering. It is, moreover, near enough to a fine art to demand some special gifts that few men possess. The late Luther Stieringer, for example, had a fine artistic instinct for harmonious and brilliant effects, that came through no special training in engineering, and that no engineer has at all equaled. One of the most serious questions to-day is how to find and train men who shall know what to do with artificial light beyond the mere technique of wiring in piping. Our British friends have this problem before them just as we have here, and there is as yet no definite answer Technical schools have, with a few notable exceptions, thus far fought rather shy of offering courses on illumination. The subject does not belong to electric engineering more than to chemical engineering or architecture, and hence it is not easy to fit it into any particular place, without elbowing out something that is supposed to be more appropriate just there. In course of time all this will be changed, but for the present it is mostly a case of self-education, which is a mighty good kind of education when one is a conscientious instructor. The British society has, like our own, wisely disclaimed the formal title of "Illuminating Engineers," and calls itself merely the Illuminating Engineering Society. It might well go a step further and discourage the promiscuous use of the title of Illuminating Engineer, save by those who have serious right so to denominate themselves. Our own society has been devoting much consideration to this very subject. It is unfortunately the fact that, purely for trade purposes, the title has been very improperly

used. We heard the other day of a concern that loudly proclaimed that it had forty "Illuminating Engineers" in its employ. This would be a joke were it not in such execrable taste. The two societies can do excellent work in suppressing this sort of noisy boasting by precept and example. They can also well devote some energy to a propaganda for education in illuminating matters, to the end that there may be a supply of well-trained men for the future needs of the art.

The British society starts out with influential friends and with a degree of enthusiasm that speaks well for its future. It has before it a vigorous campaign of education, and plenty of hard work. But in some respects its position is encouraging. It is in closer touch with the rapid development of things on the Continent than we are here. There is much activity in the use of new illuminants, and a stiffer fight between gas and electricity to keep things moving. There is also plenty of interest in engineering in all its branches and a better opportunity for engineers to get together than there is in our own country. Here the distances are so prodigious that much of the work of any society must be done in local sections if it is to progress rapidly. London, however, is unique in its availability as a center, and can draw in for any given cause a larger proportion of the total activity of the country than any other city in the world, Paris, perhaps, excepted. It is in many respects an ideal city for the organization of a technical body, despite its immense area. If the British Illuminating Engineering Society makes the most of its opportunities it will be able to command a respect and find a field of usefulness that will be altogether gratifying. But all this means a deal of hard work. In some respects nothing is more trying than conducting a campaign of education. As it drags its course along it seems that very little progress is being made, and it is sometimes a long time before results begin to show. Then, fortunately, they often develop with astonishing rapidity. Such has been the case with illuminating engineering in this country, and such will doubtless be the experience of our British friends. The chief thing is to keep at it persistently, never getting disheartened at things that are temporarily going wrong. When the ultimate purpose of the work is to benefit the public, the public will before long find it out and respond. Thus we give greeting to the new society, and wish it prosperity from the start and increasing success as it goes along and does its work. There is need for its work, which is the very best augury for a bright future.

Protection Afforded by Condensers Against Surge Voltages.

In Europe, one of the safeguards against atmospheric or artificial lightning in transmission—and distribution—circuits, of recent years, has been glass tube condensers connected between line and grounded at the entrance of the lines to a station. The reasoning has been that if a sudden steep wave of voltage came in over the line, it would be lowered in potential by absorption into the condenser, and thus the machinery within the station would not be subjected to the same intensity of electric stress as when no such condenser was used. The objection raised against such condensers has been not only their expense of installation, but also their influence on increasing the charging current of the line connected with them, thus lowering the plant efficiency of the machinery.

A lengthy mathematical article on the question of the advantage in such condensers has recently been published by Dr. Iwan Döry in *Elektrotechnik und Maschinenbau*. The article shows that much depends upon the duration of the disturbance giving rise to the surge. When a transmission line is quickly interrupted, we get an artificial lightning disturbance in the line or a surge. This surge runs to and fro along the line, being gradually absorbed by frictional resistances, or I^2R losses. If the current on the line is interrupted with infinite suddenness, the surge of voltage will be the greatest that the said current strength is capable of creating in that particular system. But if the current is interrupted in a more gradual fashion, the surge is diminished in amplitude but sustained in duration. It is claimed that the benefit derivable from the condenser is greatest in the case of very sudden disturbances, but that, on the contrary, when the disturbance is longer drawn out, the wave of voltage may cease to be reduced by the presence of the condenser; or may be actually increased thereby. The value of the condenser as a lightning protector is thus rendered very questionable. It would seem that an automatic discharge valve is much more likely to protect a line against over-voltage than a mere elastic receptacle of the condenser type. A valve does not necessarily increase the wattless current on the line. For this reason, the electrolytic lightning protector has many advantages; being always ready to discharge over-voltages by overflow from the line, without allowing the dynamo current to follow.

Temperature Elevation of Dynamos and Transformers.

It is well known that when any electric apparatus, for example, a transformer, is placed under steady rated load starting from rest at the normal temperature of the surrounding air, the apparatus begins to rise in temperature at a certain rate, but as time goes on this rate of temperature increase declines until, after a sufficient lapse of time, the temperature-elevation becomes substantially constant. According to the elementary theory of the heating of such machines under steady load, the curve of temperature-elevation with temperature is of the same shape and character as the curve of rise in the current flowing through a circuit, after closing the same upon a steady e.m.f., like that of a storage battery. In the rise of current in a circuit under steadily impressed e.m.f. as well as in the rise of temperature in a machine under steadily impressed load, there is a quantity called a "time-constant," which may be defined as the time required to raise the current, or the temperature-elevation, 63 per cent of its full ultimate amount. The electromagnetic time-constant of a circuit in the absence of iron cores is ordinarily less than one-hundredth of a second. In ironclad machines and apparatus, it is ordinarily less than one second, although it may be considerably more. The thermal time-constant of a dynamo-electric machine, or piece of apparatus, depends upon the size and nature of the same, and is commonly several hours. The thermal time-constant of a machine, such as a railway motor, may be a matter of considerable practical importance to the engineer who undertakes to provide motors for a given size of car, on an assigned length and profile of road, with a definitely prescribed time-schedule.

An article recently published by Dr. Gustav Benischke in *Electrotechnik und Maschinenbau*, deals with the measurement of the thermal time-constant of electrical machines. It shows that the time-constant may be determined very conveniently, and with

a satisfactory degree of precision, by allowing a heated machine to cool down under normal conditions, while observing its rate of temperature decrease. If the curve of falling temperature be plotted, to temperature-elevation as ordinates, and time as abscissas, the tangent to the curve drawn downward from the start, or point of initial temperature, will intersect the base line, or line of zero temperature-elevation, at an interval equal to the thermal time-constant of the machine. If the conditions of heating after the application of load were identical with those of cooling after the removal of load, a tangent similarly drawn from the starting-point of a curve of rising temperature should likewise intersect the line of maximum temperature rise, at a time interval from the start equal to the time-constant. Dr. Benischke shows, however, that there is considerable uncertainty in the time-constant thus measured on a curve of rising temperature. The best way to arrive at the result is to warm the machine by the application of load, and then to determine the time-constant from the curve of cooling off.

ON SO-CALLED STREET ILLUMINATION.

The growth of lighting in the streets in American cities has been a curious phenomenon, and considering its character, it is rather remarkable that the net result has been even what it is. In the beginning was the old open arc lamp dispensed by the early lighting companies at a great price. When the smooth-tongued representative of some system or other came into town to work the city fathers for a franchise, he was seldom ultra-conservative in his statements of candle-power, and by the time he was through with spellbinding the city fathers were firmly persuaded that Old Sol himself would be doing sentry duty at every street corner. Since all men are here assumed to be free and equal, all streets where men live must be of equal importance, and hence the "2000-cp" arcs must be spaced impartially in the streets save, of course, where an exception might be made in favor of some great public benefactor dispensing necessary fluids to the community. So it came about that the spacing of the arcs in the ordinary city became what from the standpoint of illumination is a huge practical joke upon the public. In the past and even up to the present time lamps for city lighting have been spaced at 600 ft. to 1000 ft. apart. The coming of the newer enclosed arcs, exploited energetically on the strength of lessened cost of trimming (obtained at the cost of luminous efficiency), did not help the matter at all when, as usual, the substitution was made lamp for lamp, since the illumination became practically negligible at about the same old distance. Very large claims were made for the distribution curves of the new arc, but unhappily the differences rose to material consequence only when the actual values of illumination were too near zero to be worth considering. It has taken a good many years to bring enough improvement in the spacing of the arcs to do material good, and even now spacing close enough to light the street as a whole is only to be found in an occasional thoroughfare in an occasional city. One reason for this neglect is that it is a troublesome and costly affair to change the spacing when once established unless one is willing to go to the extent of halving it, which implies paying for double the number of lights. Hence old errors have been perpetuated, and improvement has been very slow, especially as the tendency has been to decrease the power of the individual arcs.

The obvious faults of lighting derived from too infrequent arcs have been productive of a very active flank movement inaugurated by the gas interests. "You can see at a glance," said the gas man, "that arcs are ill adapted for street lighting on account of the bad distribution in the spaces between; what you really want to judge a street by is the minimum illumination between lamps as given, for instance, by our beautiful Welsbach"; and he then proceeded to show how uniform the lighting could be made with small units put near enough together. All of which need not be denied, but one should remember first, that big units properly spaced would give even more light, and that the argument for uniformity would hold, even more strongly, for, let us say, kerosene lamps placed near enough together, irrespective of the total flux of light rendered available. Just at the present time the advent of the tungsten lamp has enabled the central-station man to hit back at the Welsbach very effectively, but let him beware of pushing the argument for minimum illumination too far, for it is likely to fly back and smite him. The real trouble with most streets is that the light flux is not only ill-distributed but too small to do the work. Consider, for instance, a street 60 ft. wide. It contains 316,800 sq. ft. per mile of length. If illuminated by arcs it may get as much as a total of 7 kw or 8 kw, or, at the most, about one-fortieth of a watt per square foot of surface. If lighted by incandescents it generally gets no more than about half of this minute allowance. Now even with modern and efficient illuminants used indoors, with all the advantage of reflection from walls and ceiling, this is hardly enough to make darkness visible. It is about what one common 16-cp lamp would do in a dingy room 50 ft. to 60 ft. square.

If it were not for the enterprise of the storekeeper in lighting his windows for advertising purposes, the streets of most cities would be for all practical purposes in utter darkness. It is the private lighting that saves the day, though only here and there when one takes the cities as a whole. And where should the blame for bad conditions be placed? Certainly on no one group in particular. Some city governments are far too parsimonious in their appropriations for public lighting, yet in many places the expenditures for this purpose have increased with all the rapidity justified by the other expenditures and by the rate of taxation. The use of inefficient enclosed arcs, especially those of small amperage, has been a persistent cause of poor results, and so also has been the ill-cared-for gas mantle generally found whenever agitation for better lighting has died away. More than all, the general laissez-faire policy with regard to existing minor evils which characterizes American civic life, has prevented active improvements. "The lamps will do all right, only let's have them a little cheaper" is the frequent song, just as the chap mixing a highball ventures the opinion that the city water is good enough—only a thousand cases of typhoid a year, and those mostly in the "poorer quarter"—why disturb vested rights in the water company? An awakened interest in having things as they ought to be, instead of letting them go because they are not absolutely intolerable, is one of the most encouraging signs of the present time in civic affairs. The result of it is going to be great improvement all through municipal activities, and we hope and believe that public lighting will come in for its share of improvement. The "psychological moment" for action has now arrived, since the new material and methods recently available will enable great results to be reached more quickly and cheaply than has ever been possible before. The main thing is to get the work promptly under way.

Traction Rehabilitation Controversy in Chicago.

The daily newspapers in Chicago devoted considerable space during a few days last week to alleged errors in the accounting methods adopted by the Chicago City Railway Company and the Chicago Railways Company in the rehabilitation of the street railways in that city. But after the stir which the first articles caused subsided, the affair proved to be merely the result of misunderstandings of the true situation on the part of the newspapers and, to a certain extent, of the city authorities as well.

As is well known, the reconstruction work now being conducted by the Chicago railway companies is being done under the direction of the Board of Supervising Engineers, of which Mr. Bion J. Arnold is chairman and chief engineer, and under the franchise the city shares in the net profits to the extent of 55 per cent. For this reason, an important distinction is made between the expenses of construction and operation to be charged to the joint account of the companies and the city occurring after the ordinances took effect, and those properly belonging to the period before the companies accepted the ordinances. The duty of passing upon all purchases and auditing all expenditures for the joint account devolves, by law, on the Board of Supervising Engineers. In the progress of this work a question arose last October as to the proper classification of expenditures of the Chicago Railways Company some time previously, aggregating $119,000, which had been charged to the joint account by the company as an operating expense. As there seemed to be some doubt as to whether this was the proper classification, Mr. Arnold, at the request of the city and also of the Railways Company, agreed to go over all of the vouchers of both companies.

About Feb. 11, before the work of auditing these vouchers, numbering over 20,000, was concluded, Mayor Busse received a letter from Philadelphia charging that secret discounts from quoted prices were being given by different manufacturers on sales made to the Chicago City Railways Company and alleging that no credit was given for these discounts in the accounts which the company filed with the Board of Supervising Engineers as the cost of the apparatus. Both the name signed to the letter and the address given in it proved on subsequent investigation to be fictitious. A full investigation was made of the matter, however, and it was found that only the net payments made by the company were being charged on the books, and that the Board of Engineers had full knowledge of these discounts, had approved them and had seen that the city had received its proper credits for them in the joint account. The examination, however, showed that the Chicago City Railway Company had in some instances been securing somewhat lower prices in its purchases than the Chicago Railways Company. The only figures made public were those on rotary converters. For rotaries of the same size and type the Chicago City Company had paid $16.15 per kilowatt and the Chicago Railways Company $16.25 per kilowatt. During this investigation, the Mayor gave to the public press the letter mentioned and this, in connection with distorted rumors of the reasons for the audit of the Railways Company's accounts, caused some excitement until the facts became known.

In the meanwhile one of the sensational daily papers published in Chicago appears to have conceived the idea that the Board of Supervising Engineers was extravagantly administered and this view seems also to have been taken by some of the local politicians, who were perhaps piqued because the patronage of the board had not been placed at their disposal. The payroll of the board was published, and for several days the attention of the newspapers was diverted to that body. It was shown, however, that the salary of Mr. Arnold had been specified in the ordinance which was ratified at the election, and that the work of the board was being conducted very economically and efficiently. Other allegations made at the same time proved utterly groundless or due to a misunderstanding of the facts. Thus, it was said that both of the railway companies kept two sets of books, and that one set was for public record and the other for the company's own information. It was shown, however, that the second set of books was simply that used by the companies for keeping the record of the disposition of the 45 per cent net profit to which the companies under the ordinances are entitled and hence was perfectly proper; and that there was only one set of books of construction and operating accounts relating to the joint accounts of the city and the companies, which, moreover, were being kept upon forms prescribed by the Board of Supervising Engineers and approved by the city comptroller.

The incident assumed most prominence between March 7 to 10, but as the facts became known the discussion subsided and by March 11 reference to the matter disappeared from the first pages of the city press. The net result of the controversy of three or four days was to make even more evident and clear that the public interests in Chicago are being well protected.

Suggested Changes in the National Electrical Code.

The Underwriters' National Electric Association has sent out its bulletin containing committee reports and suggestions for changes in the Code which will be considered at its meeting at 32 Nassau Street, New York, on March 24 and 25. Unanimity of action on the part of all the associations interested evidently being unobtainable, the committee on the grounding rule believes that while the Underwriters should use all their moral influence in supporting a rule which may seem advisable in order to lessen life hazard, they have no right to enforce a rule which cannot be defended on the ground that it involves a fire hazard. The committee therefore recommends that the rule remain as it is, with a proviso that should its recommendation not be accepted and grounding be made mandatory, failure to observe the rule cannot be penalized by increased insurance rates. Thus, so far as the insurance interests are concerned, mandatory grounding rules would have merely a potential existence.

The committee on circuit-breakers has formulated a set of specifications for their manufacture and has, in addition, prescribed a number of rules for their installation. According to the latter, the use of automatic overload circuit-breakers is recommended, and when such a device on a motor starter disconnects all the wires of a circuit, the switch ordinarily required may be omitted. Overload-release devices on rheostats do not dispense with the cut-out required if they are inoperative during the starting of the motor. Each feed wire from a railway power plant before it leaves the station must be equipped with an approved automatic overload circuit-breaker. Excepting on main switchboards, or where otherwise subjected to expert supervision, circuit-breakers will not be accepted for single-phase work unless fuses are also provided. One side of the line may be protected by a circuit-breaker and the other side by a fuse up to the maximum capacity for which enclosed fuses are made; for circuits above that capacity circuit-breakers only will be required. The circuit-breaker must not be set more than 30 per cent above allowable carrying capacity of the wire, unless a fusible cut-out is also installed on the circuit, in which event the circuit-breaker may be set as high as 100 per cent above such capacity.

The committee on cabinets reports specifications for wood, composition and metal cabinets, which go into greater detail and appear to accord more closely with present practice than the rules now in force. The laboratory report on flexible cord and cables calls for some slight changes in the present specifications covering such material with a view to preventing broken strands puncturing the insulation and to strengthening the cord against mechanical injury. Specifications covering theater stage cable, border cable and elevator lighting and control cables are reported by the committee appointed at the meeting last year. The committee on details of switchboards reports adversely to any additions to the present rules. Since 125-volt Edison plug

fuses have been found on 250-volt circuits, it is recommended that this type of cut-out be no longer approved for 250-volt service and that it be limited to voltages of 125 and under. The same committee also recommends that a rating for snap switches be not standardized and that these be examined and tested as heretofore. The rules governing signaling systems have been modified slightly.

The committee on auto-starters reports that in view of the radical changes being made and in contemplation by manufacturers specifications for testing the same, both from an electrical and mechanical standpoint, would be obsolete within a short while. Certain features affecting safety should be applied, in the opinion of the committee; the features particularly referred to dealing with hand-operated compensators. It is recommended that these be equipped with no-voltage release so that the switch will return to the "off" position when the voltage fails. The switch should also be arranged so that it cannot be left in the starting position and the lever so designed that it cannot be moved to the running position before passing through the starting position.

Among the suggested changes which will come up for consideration are the following: Rule 12, outside work; new paragraph: For conduit work, wires must be placed so as to conform to rules for unlined conduit except that the conduit system must be waterproof if the wires are not provided with a lead sheath. Another suggestion calls for supporting wires on exterior walls of buildings at least every 15 ft.; this distance to be shortened if the wires are liable to be disturbed. A fine-print note to Section *g* is suggested as follows: Where low-potential wires enter buildings in the vicinity of awnings or where awnings are liable to be placed, wires will be considered as exposed to mechanical injury and must be protected by being run through iron conduit so that wires will clear awnings about 2 ft. The distance between inside pins on cross-arms in Section *h*, it is recommended, should be made 24 in. instead of 26 in. For show windows it is suggested that conduit or armored cable be employed except in the upper part of the window well out of reach and not exposed to injury or moisture, where other forms of wiring may be employed. Numerous changes are recommended in the specifications for fittings, etc. Among the miscellaneous suggestions are the following: That metal-shell key sockets be prohibited in basements, bathrooms, kitchens and other places having grounded surfaces. That relative positions of service switch cut-out and meter may be changed in order to prevent theft of electricity. That all lamps requiring over 175 watts be equipped with a base so formed that the lamps will not fit sockets or receptacles of lower wattage. That the grounding of metal ceilings to water pipes be required. That rules be made requiring the wattage of Nernst lamp glowers. That self-starters be attached to all alternating-current motors. That the maximum weight of any energy-consuming device, together with the shade or other special fitting which would be allowed attached to a pendant flexible cord, be fixed. That there be a rating of wattage for ceiling and desk fans. That pilot lamps be required on all heating devices except luminous radiators. That insulating joints and insulation of fixture canopy may be omitted where straight electric fixture is used with complete conduit or armored-cable system, in which the double-braided, rubber-covered wire projects through the stem of the fixture connecting directly with the socket. That the use of wooden molding on metal ceilings be prohibited. That a rule require the circuit leading to outside lamps fed from the house system to be equipped with a double-pole switch just within the point of entrance; the requirement to apply to outline lighting, signs and arc lamps. That the use of knobs inside sockets and rosettes for the purpose of relieving joints and binding screws from strain be prohibited.

Panama Electric Power.

Six Curtis 1500-kw turbo-generators have arrived at the Isthmus of Panama for installation at Gatun and Miraflores, where power houses are now under construction for the permanent electric power generating plants which will supply electrical energy for the work of construction of the locks at Gatun, Pedro Miguel and Miraflores. Foundations are being rapidly constructed for the machinery received and the power houses will be entirely completed within a few months.

All operations in building the locks will be conducted by electric power from the time the raw material is received in scows coming up the old French canal until the concrete is in the forms at the locks. The power plant will be laid out and the feeders so arranged that the consumption of kw-hours of each operation can be ascertained. The Gatun plant will be ready first for operation. After the locks are built the steam power plants will be held in reserve to operate the locks at times when the proposed hydro-electric plants may be short of water.

Damage by "Inaugural" Blizzard at Baltimore.

While the lines of the Consolidated Gas, Electric Light & Power Company of Baltimore did not suffer damage during the blizzard of March 3 and 4 comparable with that experienced by telegraph and telephone companies, yet it was necessary to shut off current shortly after midnight on March 4 at the request of the Department of Public Safety. The rapidity with which the system was restored to working condition brought to the management of the Consolidated company many congratulations, and an account of the manner in which this work was done is given below.

An idea of the extent of the work may be gathered from the statement that the overhead system comprises 5000 miles of wire, every foot of which was inspected before service was resumed; 6000 poles; 200 miles of wires within the city's limits, and 2500 city arc lamps. Almost in the teeth of the storm the electric division of the company had its men at work. Out of the 6000 company poles there were only 75 poles down. The principal work consisted in going over the lines and cutting off foreign wires that had fallen across the feed wires. As the number of telephone and telegraph wires are many times greater than the number of feed wires, this task in itself was an enormous one, particularly as the positive orders of the management were that no chances should be taken with stray wires likely to cause damage to life or property, this making it necessary as each circuit was cleared to go over it again and inspect every foot of the lines before the current was turned on. As soon as the inspection showed that everything was in good shape the current was turned on the various circuits, and in this way the restoration of service was rapidly accomplished as the work of clearing up the lines advanced. The first service to be restored in the overhead district was that of direct-current power users. This was a great help to many small manufacturing concerns, and they were able to get this current the day following the storm. This was followed by restoration of service to the congested city districts, and within 72 hours after the storm practically every district in the city below North Avenue was furnishing current, and before the week was out all of the 2500 city arc lamps in this district, with the exception of 25, or about 1 per cent, were again in operation. The clearing up of these circuits represented quite a job in itself, as they cover 200 miles of streets. As with the other circuits of the company, every foot of the arc circuits was gone over twice, first by the men clearing up and making repairs, and second by the inspection force.

As the various circuits were cleared up and put in operation the gangs of men were split up and followed the spurs running from the circuits and the service connections from these spurs. It is the purpose of the company to follow this work of inspecting every foot of its lines right to the premises of every consumer. The replies to a communication sent to all the current users in the overhead districts showed that practically very few consumers were without current, and those that were without it received immediate attention. Most of

the replies had some word of congratulation for the wonderful work which the employees of the company had accomplished in so quickly restoring service.

All of this work was carried out by the operating department of the electric division of the company under the immediate direction of the following officials: Assistant general manager, Mr. Wm. Darbee; superintendent of distribution, Mr. W. P. Beyerle; general foreman of distribution, Mr. Wm. T. Russell. Mr. Herbert A. Wagner, director of the electric division, spent considerable time with Assistant General Manager Darbee in going over the work, these officials making a number of automobile trips all through the affected districts. About 200 men were employed in this work, including not only the regular force of the company, but additional men secured in Philadelphia and other cities.

Southern Electrical and Industrial Exposition.

The electrical part of the Southern Electrical and Industrial Exposition, to be held in the First Regiment Armory at Louisville on April 12 to 24, promises to be of considerable interest. There are 54,000 sq. ft. of floor space available on the main floor and this has been divided into over 200 exhibit spaces. The exposition company is financed by the Commercial Club of Louisville, and the business men of that city and of Jeffersonville and New Albany, Ind., are advocating the show with enthusiasm. Mr. Fred. W. Keisker is president of the exposition company, which is incorporated, and Mr. A. T. Macdonald is the secretary. Mr. G. Wilbur Hubley, of the Louisville Lighting Company, is one of the directors and also in direct charge of the division of power. The division of illumination is in charge of Mr. Lewis S. Streng.

Alternating current for lighting in the exposition hall will be furnished at 108 volts, 60 cycles, single-phase, and direct current for motors will be furnished at 500 volts. Motors of ½ hp or less may be served from 108-216-volt, 60-cycle, single-phase mains. All lamps, fixtures and appliances, including wiring in exhibitor's space, must be furnished by the exhibitor. Flat rates are provided for lighting for carbon, tungsten and arc lamps and also for motors. On meter rates electricity will be sold for power at 5 cents per kw-hour and for lighting at 6 cents per kw-hour. The company will provide a general scheme of illumination, but exhibitors are requested to install special illumination for their own spaces. Private telephones may be had from the Cumberland Telephone & Telegraph Company or the Louisville Home Telephone Company. A charge is made for exhibit space.

The promoters of the show say that the South is rather deficient in electrical development, and one of the aims of the exposition is to arouse a greater interest in electrical applications. The railroads have granted a fare of one fare plus 25 cents for the round trip from all points south of the Ohio and east of the Mississippi.

Extensions of Chicago Drainage Canal Power-Transmission System.

Considerable construction work is under way for the Sanitary District of Chicago, which operates the hydro-electric power plant at Lockport, Ill., on the Drainage Canal, and also the transmission and distribution of electrical energy from that plant. The current is transmitted to a terminal station in Chicago, at Thirty-first Street and Western Avenue, at 44,000 volts. Three substations are being built, located, respectively, at West Twelfth Street and Forty-eighth Avenue; Ashland Avenue and Thirty-seventh Street; Leavitt Street and Fullerton Avenue. Two other substations in the city are projected and will probably be built this year. Current is sent from the terminal station to these substations at 12,000 volts, and in the substations is stepped down to 2300 volts, at which pressure it is distributed to the points of consumption. For use the current is further stepped down on or near customers' premises to 110-220 volts. Some of the 12,000-volt lines are underground, and it is probable that underground lines to all the substations will be built this summer.

In the generating station at Lockport four generators are in use, having a total capacity of 16,000 kw. By the first of July it is expected that this rating will be increased to 20,000 by the addition of a fifth machine, while still another generator will bring the total up to 24,000 kw by the first of September unless there is unexpected delay.

The Sanitary District has taken contract to operate the municipal electric light and water-works plant at Blue Island, a suburb of Chicago. A transmission line is being built from Morgan Park, another suburb, where similar service is now rendered, to Blue Island, a distance of two miles. The pumps of the Blue Island water works will be driven by induction motors and Drainage Canal current will be transformed down for lighting the streets and for commercial lighting. An arrangement has also been made by which Lincoln Park, in Chicago, will be lighted by electricity from the Drainage Canal plant, which will also be used to perform the pumping in the park.

An Important Telephone Decision.

The Indiana Supreme Court has rendered a decision relating to the exchange of service through physical connection of rival lines. In this case the court was asked by the complaining company to compel the defendant company to restore the connection which had been severed in order to enforce the payment of disputed tolls. The court held that a telephone company is a common carrier of messages, and when the owner of one system of telephones and exchanges has made physical connection between his and other lines and exchanges in the surrounding country under an agreement for interchange of service for an intermediate period, and each has developed his own telephone system with reference thereto, the courts will, upon a proper proceeding, restrain the owner of such telephone system from severing relations with a single one of the connecting lines and exchanges, or compel him to restore a severed connection. The court ruled, however, that the complainant should have paid under protest the amount claimed as due for tolls and then recovered the same; that this was his adequate remedy and for his failure to invoke this remedy he was not entitled to a writ of mandamus to compel restoration of connection. The court added that after actual physical connection has been made between the lines of two systems of telephones, the property of each is impressed with such a public interest that neither can disregard it.

Students' Electrical Exhibition.

The students in the department of electrical engineering at the Michigan Agricultural College, East Lansing, Mich., gave an electrical exhibition on Thursday, Friday and Saturday afternoons from 3 to 6, on Feb. 25, 26 and 27. This is the second year of the M. A. C. department of electrical engineering and it was thought that it would help materially to show in this manner what is being accomplished in some lines of work.

Eighteen rooms in the new engineering building were used to display all kinds of applications of electricity to domestic purposes, including some examples of how the various rooms in a home should be lighted using the modern illuminants; examples of applications of motors to domestic purposes, such as pumping water, running washing-machines, sewing-machines, a little grinder for sharpening knives and two examples of vacuum-cleaning apparatus. A private lighting plant was installed, the generator being driven by a gas engine. Other exhibits were an electric welder, heating appliances, etc. Some high-tension experiments were shown and other entertainment features given each evening. The Legislature being in session, the members received a special invitation and quite a number attended. The total attendance ran up pretty well toward a thousand in the three evenings. Prof. A. R. Sawyer is in charge of the electrical engineering department of the college.

National Electric Light Convention.

In making up the program for the coming convention of the National Electric Light Association, at Atlantic City, June 1-4, the policy has been adopted of having editors prepare papers, with the assistance of sub-editors in various parts of the country, so as to cover the subject in the most comprehensive manner. There will be two days of general convention in which the program will be presented to the whole meeting, while Thursday and Friday will be given over to parallel sessions, technical, commercial and accounting.

The manufacturers' exhibition will be held in what is known as the Main Building, on the Million-Dollar Pier, a large hall directly facing the boardwalk and exceptionally suitable for the purpose. The booths, each having a frontage of 9 ft. and a depth of 15 ft., will be arranged horseshoe fashion, leaving in the center a space approximately 70 ft. wide and about 140 ft. long. It is planned to furnish this space with rockers and rugs, making it the convention exchange. The entrance to the hall is so placed that delegates must pass the exhibits to reach the meeting halls and other points on the pier. To the left of this entrance will be located the office of the secretary and to the right the registration bureau. The floor plan and a letter incorporating the details of the exhibition are in course of preparation and will be forwarded to members within a few days.

The Trunk Line Association has authorized a rate of a fare and three-fifths for the round trip, on the certificate plan, from all points in its territory to Atlantic City and return.

New York Public Service Commission News.

Mr. Theodore P. Shonts, president of the Interborough-Metropolitan Company, has sent to the Public Service Commission of the First District of New York the details of his proposal to build subways in the city. The general plans as offered by Mr. Shonts were accurately outlined in the last issue of this paper. They comprise a double-track subway from Forty-second Street and Seventh Avenue under Seventh Avenue and some of the other downtown streets to a terminus at the Battery; a double-track subway from Forty-second Street and Lexington Avenue, under Lexington Avenue to a terminus near 149th Street in the Bronx; the construction of a center express track on the Second Avenue and Third Avenue elevated structures; the lengthening of the platforms of the existing subway stations so as to permit the operation of 10-car express trains and six-car local trains on the present tracks. This last improvement, Mr. Shonts declares, will add 25 per cent to the capacity of the subway, can be completed within 10 months and will cost only $1,000,000. The Public Service Commission has referred these plans to its engineers, but it does not seem likely that the two newly proposed routes will meet with approval. The plans which the commission has under consideration are for a four-track subway under Lexington Avenue to a point beyond the Harlem River, one to the neighborhood of Van Cortland Park and the other to Pelham Bay Park on the Sound. The commission's plans also contemplate a four-track subway from Forty-second Street and Broadway south. It is not likely that the commission will approve Mr. Shonts' plan for central express tracks on the Second and Third Avenue elevated structures. It is pretty well understood that the commission will not approve plans for any new elevated structures nor for any additions to the existing structures. Although Mr. Shonts in submitting this proposal intimated that it must be taken in its entirety, or not at all, the commission has already accepted the plan for lengthening the platforms of the present subway, and it is probable if the Interborough does not voluntarily undertake this work at the commission's suggestion, that an order will be issued to compel the improvement to be made.

Mr. William J. Wilgus, president of the Amsterdam Corporation and former vice-president of the New York Central Railroad, has submitted a comprehensive plan to the Public Service Commission which he describes as an Inter-Terminal Belt Line. This plan provides for a four-track elevated electric railroad from the terminus of the New York Central Railroad, near Sixtieth Street and North River, southerly along the waterfront to the Battery; thence a two-track elevated railroad along or near the southern waterfront to the East River and up the East River waterfront to a point near Forty-second Street; thence by subway under First Avenue and Forty-second or Forty-third Street, connecting with the Grand Central Station, and on under the same streets to Seventh or Eighth Avenue; thence under Seventh or Eighth Avenue to the Pennsylvania Railroad terminal at Thirtieth Street, and from there, by either subway or elevated structure, through Thirtieth Street to the main line on the North River front. The plan also contemplates a subway or elevated structure from the North River line through Fifty-ninth or Sixtieth Street to the Blackwell's Island Bridge, and thence under First or Second Avenue to connect with the East River line at Forty-second Street. The purposes of this road are set forth as being for transportation of both passengers and freight.

The Public Service Commission has announced that it would in the near future approve of the application made by Mr. William G. McAdoo, president of the Hudson & Manhattan Railroad Company, for an extension of that company's subway from Thirty-third Street north, under Sixth Avenue and Bryant Park to the Grand Central Station at Forty-second Street and Park Avenue. This improvement can be made without any change in the existing laws.

The Public Service Commission, acting upon the demands of the large number of persons who use the Eighty-sixth Street crosstown car line, has issued an order directing the receivers of the Metropolitan Street Railway Company to restore a through service from Eighth Avenue on the west side of Central Park to the ferry at East River on a basis of a 5-cent fare. Since the severance of this company from the Metropolitan system it has been operated in two sections, and two fares have been charged for the through trip across town.

The Appellate Division of the Supreme Court in New York City has unanimously affirmed the decision of Justice Gerard, upholding the validity of the public service law in New York. The suit in which this was rendered was brought in the shape of an effort to prevent the city from paying the expenses of the commission. The present decision holds that the law is valid and that the city is responsible for the salaries and expenses. The decision does not cover any point involving the authority of the commission over public utilities.

The Public Service Commission of the First District of New York has dismissed a complaint that has been pending against the New York Edison Company, alleging that it was guilty of a nuisance on account of the cinders emitted from the stacks of its power house near First Avenue and Fortieth Street. Commissioner Maltbie, who prepared the order, declared that the trouble had been very greatly reduced by the company, and that other improvements were in progress. He said that in view of this readiness on the part of the company to remedy the trouble, the complainants have expressed themselves as entirely satisfied.

Mr. Henry B. Seaman, chief engineer of the Public Service Commission for the First District of New York, has submitted a report in which he declares that the plan, suggested by the engineer of the Board of Estimate, to cut down the proposed Fourth Avenue, Brooklyn, subway to two tracks would lead to worse transit confusion than now exists. Mr. Seaman insists that four tracks are necessary in this subway system in order to provide for the branches which will run from the main line to Fort Hamilton and to Coney Island.

The Public Service Commission of the Second District of New York has given its consent to the consolidation of the Watertown (N. Y.) Light & Power Company and the Watertown Gas Light Company.

The Syracuse Lighting Company has made application to the Public Service Commission of the Second District of New York for consent to the making and delivery of a mortgage to secure a $2,500,000 bond issue. The bonds will bear 6 per cent interest, and the proceeds will be used for extensions in the distributing system and improvements in the central power station.

The Anniversary Dinner of the Institute.

The American Institute of Electrical Engineers celebrated the completion of its first quarter of a century with a banquet at the Hotel Astor on the evening of March 11. About 300 were present. Several unusual and unique features gave the affair special éclat. A most successful experiment was that of turning the ballroom into a Venetian chamber. Across the west end was placed a theatrical drop scene representing the Grand Canal, with the Doge's Palace, etc., and this was seen through a large balcony opening set with flowering plants, vines, etc., while border lights were placed just inside the balcony and lamps were also placed so as to illuminate some of the scenic windows. On the south side of the room a similar scene represented the approach to the Rialto, which was bordered with palms and flowers, giving an equally pretty vista. In each of the ordinary windows of the room was placed a large transparency showing some Venetian scene, and so illuminated that in whatever direction the diner looked a prospect in the City of Canals met his eye. At the back of the speakers' table were two huge American flags, surmounted by a large eagle, and through each star in the drapery of the flags came a frosted incandescent lamp. The effect was immensely pleasing and novel. From the beak of the eagle hung red, white and blue streamers carrying a transparency of the badge of the Institute and the words "Silver Anniversary" in small lamps. The speakers' table was set with regular electric light standards of very ornamental design, but each of the 50 tables on the main floor was illuminated in an original manner. In order to get away from flickering wax candles and the obstruction due to the usual electric light standards a small silver bowl was set in the middle of the table within which was placed a miniature storage battery. To this were attached three miniature tungsten lamps. Above these was placed a circular block of glass simulating ice, through orifices in which water was poured; and masses of blush roses were set so that the light of the lamps came up through the glass, the water and the flowers. Here again a very beautiful and entirely novel effect was secured. Around the ballroom runs a series of small balconies for musicians, etc., and those were all densely banked with green plants and flowers, behind which were placed a number of Cooper Hewitt mercury-arc lamps, giving the effect on the foliage and blossoms of early spring sunshine. Across the ceiling of the room were suspended strings of red Christmas-tree lamps in vines, from the intersections of which dropped shaded lights on flexible cord, supplementing the regular light of the large chandeliers. The two sides of the room not occupied by the Venetian scenery were banked with palms and rubber trees and flowers in massive antique vases. The Institute has had many effective settings for its annual dinner, but probably none in which so many special and new features were thus brought out. For all of this great credit is due to the son of the manager of the Hotel Astor, Mr. F. A. Muschenheim, who was a member of the dinner committee and has been a member of the Institute for some years. It should be added that outside the banquet hall was placed a huge sign representing the badge of the Institute picked out in frosted lamps on a colored background. This was contributed by the New York Edison Company, with which were associated the Edison companies of Chicago, Boston, Philadelphia and Brooklyn in defraying the decoration expenses of the main room.

The dinner was presided over in a felicitous manner by President Ferguson. During the serving of an excellent repast cable messages, secured through the Commercial Cable Company, were read by Mr. Ferguson from the British Institution of Electrical Engineers, signed by President Mordey; from the Verband Deutsche Elektrotechnischer and from the Société Internationale des Electriciens of France, signed by President Boucherot. Among those at the speakers' table were: President L. A. Ferguson, Secretary Ralph W. Pope, Mr. E. E. Olcott, past president, American Institute of Mining Engineers; Mr. John Bogart, past secretary, American Society Civil Engineers; Mr. W. C. L. Eglin, president, National Electric Light Association; Mr. W. W. Freeman, president, Association of Edison Illuminating Companies, and Mr. Theodore Beran, acting-president, New York Electrical Society. Immediately to the right and left of the presiding officer were the speakers of the evening.

In his opening remarks President Ferguson outlined the history of the A. I. E. E. during the past 25 years and called attention to the foreign membership of 835 as indicating the high esteem in which the Institute is held by foreign engineers. The first speaker of the evening was Mr. Jesse M. Smith, president of the American Society of Mechanical Engineers and a charter member of the A. I. E. E. He stated that although technical men group themselves about the words civil, mechanical, electrical and other names indicating special work, yet all are engineers. The work of each group so overlaps the work of the others that in order to find himself at home an engineer must join two or more groups.

Prof. Elihu Thomson responded to the toast "The Charter Members." He remarked that the 30 living charter members may properly experience especial satisfaction for the progress of the Institute, and expressed the opinion that after another 25 years the greater strides in the electrical industries as reflected in the greater growth of the Institute will give occasion to another similar celebration, but the marvelous record of advancement in the art is unlikely ever to be duplicated.

President Ferguson announced that a diploma of congratulation will be presented to each living charter member of the Institute. In response to his request, the following seven charter members who were present rose as their names were called: C. L. Clarke, G. A. Hamilton, C. O. Mailloux, T. C. Martin, Jesse M. Smith, Elihu Thomson and E. A. Sperry.

The past-presidents had as their spokesman Mr. Frank J. Sprague, who stated that among the living 17 past-presidents one name in particular stood forth for his continuous and effective activities, that of the senior past-president, Mr. T. Commerford Martin, whose journalistic career corresponded to the whole period of existence of the Institute. Mr. Sprague pointed particularly to what he termed the "inspiration of genius which used the Library Dinner given in commemoration of Dr. Wheeler's gift of the Latimer Clark collection as the vehicle to initiate effectively the interest of our modern Crœsus in the ambitious plan of the Institute, which under the direction of our then president and other officers has reached so fitting a fruition in the splendid buildings of the Engineering Societies and the Engineers' Club," and to his success as chairman of the building fund in gathering subscriptions from corporations and individual members for the $170,000 which constituted the institution's share of the conditioned capital burden. On behalf of the past-presidents of the Institute Mr. Sprague then presented to Mr. Martin a loving cup bearing on one side the inscription:

"To T. Commerford Martin, senior past-president of the American Institute of Electrical Engineers. Presented March 11, 1909, at the Quarter Centenary Celebration of the Founding of the Institute. In appreciation of 25 years of unselfish devotion to the best interests of the Institute and the advancement of the electric arts."

On the other side were the names of the 16 donors in order of seniority, as follows: Edward Weston, Elihu Thomson, Alex. Graham Bell, Frank J. Sprague, Louis Duncan, Francis B. Crocker, Arthur E. Kennelly, Carl Hering, Charles P. Steinmetz, Charles F. Scott, Bion J. Arnold, John W. Lieb, Jr., Schuyler S. Wheeler, Samuel Sheldon, Henry Gordon Stott, Louis A. Ferguson, past-presidents of the American Institute of Electrical Engineers.

The toast "Electrical Engineering as a Profession" was responded to by Dr. Alex C. Humphreys, president of Stevens Institute of Technology, and past-president of the American Gas Institute, who criticised a recent article by Mr. R. T. Crane, of Chicago, in which higher education in general was condemned. Dr. Humphreys also spoke of the commercial side of engineering, saying that although the practice of engineering should be along the most definitely marked lines of efficiency

ANNIVERSARY DINNER, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, HOTEL ASTOR, NEW YORK, MARCH 11, 1909.

and economy, both as to original investment and return thereon, yet this fact does not form a basis for a charge of commercialism.

The evening closed with the solo singing of "Auld Lang Syne" by Mr. A. Foxton-Ferguson (B. A. Oxon), the chorus being taken up in full volume by the diners. The menu of the banquet bore the badge of the Institute embossed in colors with a silver wreath, and the dates 1884-1909. Inside were lists of the officers, the past presidents, the charter members, the offices occupied by the society since the foundation, the dinner and reception committees, and the statistics of the growth of the Institute year by year. No fewer than 16 sections were officially represented and 10 of the sections occupied one table at which the geographical names were designated on a placard.

Motors in Steel Mills.

At the meeting of the American Institute of Electrical Engineers held on March 12, Mr. B. R. Shover read a paper giving a full description of the electrical equipment of the Gary plant of the Indiana Steel Company.

The generating station contains 17 2000-kw alternators and two 2000-kw direct-current generators; the latter two machines and 15 of the former are driven by gas engines using blast-

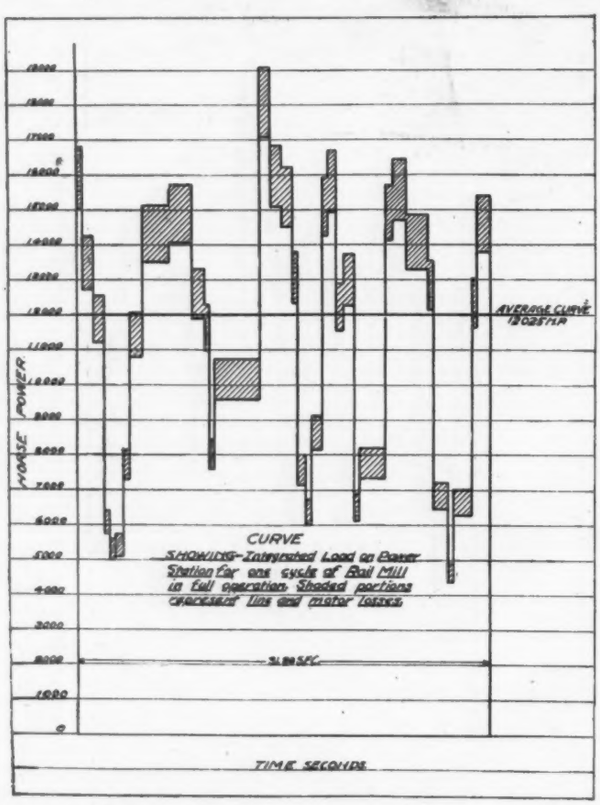

POWER
AVERAGE CURVE
CURVE
SHOWING Integrated Load on Power Station for one cycle of Rail Mill in full operation. Shaded portions represent line and motor losses.
TIME SECONDS

CHART SHOWING ESTIMATED COMBINED LOAD ON MILL.

furnace gas, while the remaining two alternators are driven by steam turbines. Use is made of two 4320-amp, 125-cell storage batteries for minimizing the fluctuations of load on the generating station; the batteries are joined to the alternating-current supply system by means of 2000-kw, split-pole synchronous converters.

Most of the motors are of the direct-current type receiving energy either directly from the generating station or from motor-generator substations. However, a very large portion of the energy is fed at 6600 volts to induction motors. The main rolls of the mill are driven by three 2000-hp and three 6000-hp induction motors, the combined rating being 24,000 hp. This mill has an output of 4000 tons of steel rails per 24-hour day, and is said to be the largest ever built. The induction motors are provided with heavy flywheels and are arranged with devices for varying the secondary-circuit resistance automatically in order to minimize the fluctuations in the power demanded by the motor equipment from the supply system.

To supply power to the train motors of this mill there are two circuits, each designed for 10,000 kw at 6600 volts. One circuit feeds energy to the three blooming-mill motors; that is, two 2000 hp and one 6000 hp. The other circuit feeds energy to the other three motors—that is, two 6000 hp and one 2000 hp. The accompanying diagram shows the estimated combined load carried by the motors with the mill working at full output. It shows the voltage and amperage of each of the circuits; the shaded portion indicates motor and line losses, and the upper line of the curve shows the character of the load on the system. This curve was developed to provide a basis for estimating the size of the storage-battery necessary to take care of the fluctuations and keep a relatively constant load on the generating station. The diagram shows that the load factor on the six train-motors is almost exactly 50 per cent; the motors are rated at 20,400 hp, the average load is 12,025 hp, the maximum total load 19,010 hp and the minimum 4300 hp.

Details of the control equipment of the plant are given elsewhere in this issue.

DISCUSSION.

The paper was discussed by Messrs. B. A. Behrend, Gano Dunn, D. B. Rushmore, W. T. Dean and Brent Wiley. Each of the speakers expressed his admiration for the installation described by the author, which was acknowledged to be the most important industrial application of the electric motor in existence.

Mr. Behrend outlined the difficulties encountered in the parallel operation of the alternators driven by the gas engines, and explained that successful results had been obtained by giving to the rotating mass a vibratory period differing properly from the explosion periods of the engines.

Mr. Dunn drew attention to the magnitude of the generating station and expressed the opinion that the satisfactory performance of the gas-engine units will result in the general adoption of electric equipments in steel mills. He said that although for the heavy services the induction motors are well suited, for many of the minor duties direct-current motors are preferable.

Mr. Rushmore remarked that the successful solution of the numerous industrial problems by applying electric motors would be looked upon in the future as having been the beginning of a new era in the electrical engineering history of this country.

Mr. Dean showed that the adoption of a non-reversible induction motor instead of a reversible direct-current motor equipment had decreased the cost of the motor equipment by 66 2/3 per cent. However, it necessitated the use of a three-high, continuously running set of rolls instead of two-high reversing rolls, and the addition of a lifting table.

Mr. Wiley outlined the numerous advantages of the electric motor over the steam engine for mill service, and explained that they greatly exceed the several minor disadvantages.

In closing the discussion, Mr. Shover stated that the generators show no tendency to hunt when fully loaded, although the ammeters indicate a certain amount of hunting when the load is light. This condition is attributable to the lack of uniformity of the thrusts exerted by the several pistons during each revolution. Due to the presence of the induction motors, there is required a considerable component of wattless exciting current and the power factor is correspondingly low, ranging from 30 to 70 per cent, according to the load. If trouble arises from the large exciting current, synchronous condensers will be installed.

President Ferguson announced that the problems encountered in the application of electric motors to mills have become of such importance that at the next annual convention of the Institute a special session will be devoted to the general subject of industrial power. All phases of the subject will be discussed at that time.

Hartford Tungsten Lamp-Service Practice.

A novel method of dealing with the tungsten-lamp situation in residence lighting has just been worked out by Mr. A. O. Dunham, president of the Hartford Electric Light Company. The Hartford company has for several months been trying out the service capabilities of the smaller sizes of tungsten incandescents designed for operation at 30 and 60 volts. Tests have shown that these low-voltage, extra high-efficiency lamps can be counted on for a life of at least 2000 hours. The filaments are tough and thick and will stand rough handling admirably. During the past three months several installations of these lamps in residence service have been made in a quiet way, and as a result the company is satisfied that it will be advantageous to introduce them generally on its circuits. In order to handle the situation profitably, however, Mr. Dunham has worked out a new plan of charging the customer for light used rather than billing installations on the usual basis of a price per kilowatt-hour. The following particulars of the scheme were obtained from Mr. Dunham by a representative of this journal:

The plan consists of the substitution of a meter dial reading cp-hours for the ordinary watt-hour dial of the ordinary induction meter and charging the customer a rate of .025 cent per cp-hour of service supplied. The customer pays the cost of installing the lamps initially, the charge being 20 cents each for either the 10, 20 or 30-cp, 30 or 60-volt lamps. Free renewals are to be given on all these lamps. The company installs an "economy coil" or compensator in each residence to reduce the potential from that of the mains to 30 or 60 volts, as the case may require. This compensator has the advantage of absorbing the effect of voltage fluctuations on the high-tension lines back of the subway transformers from which secondary groups of loads are fed, and it is provided with multi-voltage taps for convenience.

Mr. Dunham states that "the whole system of meter measurement has gradually adjusted itself to a certain ratio between watts, or the power used in creating light, and the other costs entering into the production of the candle-power. This has been particularly the case in house lighting. The general average price of house lighting in the larger cities and in the older stations has become about 10 cents per kw-hour—that is, the whole cost of light is placed upon the kilowatt measurement, whereas more than one-half the cost consists of distribution, management and overhead expenses. This is clearly shown by the fact that the same meter measurement of watts has an altogether different price when it is used simply as power. The price of power in the more modern stations and in the larger cities ranges from 2 to 6 cents per kw-hour, while the cost of light ranges from 4 to 12 cents, or about double the price, which would not be the fact if the customer paid for the same thing in both instances.

"For the power used the customer pays for the actual kilowatts, but for the light delivered the customer pays for the actual kilowatts used plus the various other expenses which have been attached by custom and necessity. This has placed all the stations in a peculiar relation to the old-fashioned wattmeters in regard to the new lamps, and they find themselves reduced in income if they use the new lamps to one-half of their old revenue. This cannot be avoided except by changing the measuring instrument or by raising the price of the kilowatts used to double that charged for the old lamps, because the wattmeter measures a little less than half the actual cost of the candle-power.

"If you are selling light from 10-cp or 16-cp lamps your customer is paying for the watts actually used plus all other expenses incurred; distribution, maintenance, lamps, and all other overhead expenses; that is, a sum which is calculated to double the watts used.

"We have only to remember that for the same kilowatts we should probably get an average of 5 cents for light instead of 10 cents, as we do at present. Modern stations are organized for the distribution of light more or less, some of them almost entirely for this purpose, and if they should substitute tungsten lamps for the 3.1-watt lamp, would find their income cut in two. The customer would be using only half as much energy as with the 3.1-watt lamps, and while the money paid for lights would only include this energy, all the other costs would still remain, and the station would receive nothing for them unless the price per kilowatt-hour could be doubled.

"For the business to survive and the plants to become actually without value, they must either double the price per kw-hour in light or get a meter measurement which will pay other expenses besides the watts used, and which enter into the question of candle-power supply. All questions as to the increased use of light on account of its lower cost, and the proper price to charge customers in consequence of the saving in the cost of production by using these new lamps, are entirely aside from this great basic fact that customers are now paying, not for the real kilowatts used, but for the kw-hours used plus the cost of distribution, maintenance and all other overhead expenses."

Mr. Dunham has concluded that, instead of charging for a "purely fictitious kw-hour," it would be much better to adopt the measuring instrument for the new lamps by such a change that this instrument may actually measure candle-power instead of a portion of it, namely, the watts. It is quite as easy to fix an arbitrary charge for candle-power as it is for watts by taking the present standard of charge per candle-power and putting a dial on the meter which will measure the candle-power in fact and not have to be translated into candle-power from watts.

Thus, the graphitized filament lamp gives 20-cp for 50 watts, or 2.5 watts per candle-power, and takes for every 400 cp 1000 watts; therefore, if 400 cp is established as a basis for charging, supposing that a 10-cent rate applies to 1000 watts, the central station may charge .025 cent per cp-hour. Therefore, if the dial of the meter is arranged to read candle-power instead of watts, the scale will show 400 cp-hours for each 1000 watts, as shown on the present meter.

Mr. Dunham illustrated the new plan by assuming a house having five graphitized filament lamps which are burned on the average four hours per day. These five 20-cp lamps burn 50 watts per hour each, or 1 kw-hour in four hours, for which the company gets 10 cents per kw-hour per day, or $3 per month. This, translated into cp-hours, would be 400 cp-hours per day, or 12,000 cp-hours per month, and for this makes the price per cp-hour .025 cent. If five 20-cp tungsten lamps are substituted, giving 100 cp for four hours per day at .025 cent, they cost 10 cents per day, or $3 per month, the exact income received when the less efficient lamps were in service. The company gets the same revenue and the customer a better light, while the improved efficiency of the tungsten lamp makes it possible in some cases to share the economy by a rate reduction. The company sells the consumer light, which he wants to buy, and at a fixed or lowered price, according to conditions. The company remains free to take advantage of the progress of the art and the customer is encouraged to make a progressive installation.

Enclosed Fuse Litigation.

The United States Circuit Court for the District of Connecticut has rendered a decision in a case involving a patent issued Oct. 23, 1900, to Joseph Sachs, covering the use of a thin strip of metal as the fusible element of an enclosed fuse. In the case in suit the defendant was charged with infringement of this patent. The court held that a patent of prior date granted to Mordey showed all of the elements of the patent in suit combined in the same way and for the same purpose, except that the Mordey strip is not the "thin strip of extended area" which is the novelty of the invention claimed to be infringed. The safety fuse alleged to infringe has as one of its elements a flat strip of some thickness, but attenuated at the crucial point so as to expedite quick breaking under abnormal current, while nothing in the Sachs patent hints at such a construction. The court decided that there was no infringement and dismissed the case. The parties to the suit were the Johns-Pratt Company, compainant, vs. the Sachs Company et al.

Meetings of N. E. L. A. Sections.

At the regular meeting of the Brooklyn section of the National Electric Light Association addresses were made by Mr. W. W. Freeman, Mr. Henry L. Doherty and President Eglin. Mr. Freeman emphasized his belief that membership in the association would aid greatly in the attainment of three essentials of every successful business man—knowledge, initiative and judgment.

President Eglin called particular attention to the notably greater benefits accruing from membership in the association as compared with the various technical and similar organizations. He spoke of the phenomenal growth of the business and the necessity for looking to the providing of means for properly handling it, by educating to the utmost every one connected with it. The association is undoubtedly the greatest single factor in this education.

Mr. Doherty, the originator of the company section idea, as well as of many of the progressive movements of the association, gave a slight sketch of his own early struggles for engineering knowledge, and said in substance that they had created in him the desire to help others gain such knowledge in an easier way, and that one of the most admirable and thorough ways for men to progress was through these organizations—through getting together and exchanging ideas and enthusiasms.

The following papers were read and discussed: "Illuminating Engineering from a Roman's Commercial Standpoint," by Mr. J. L. Wiltse; "Overhead and Underground Distribution," by Messrs. L. E. Moffitt and P. D. Sharkey; "Substations," by Mr. E. W. Babcock.

At the last meeting of the Altoona section a paper was read by Mr. J. C. Scholl entitled "Fuel Combustion for Gathering Steam."

The Rochester section has held four regular meetings. At the first of these an informal talk, illustrated with experiments, was given by Mr. John C. Parker, mechanical and electrical engineer of the company, showing some of the historic phases of the development of the electric art and illustrating the discovery of the fundamental principles. At the second meeting Mr. F. A. Willard, late commercial agent, gave a talk illustrated with lantern slides, showing the progress of the company's commercial work in gas distribution during the recent period of business depression. At the next monthly meeting Mr. T. H. Yawger, superintendent of the electric department, described the development of the generating and distribution systems in Rochester, which has been a pioneer in many of the developmental phases of the art. The fourth paper was presented March 4 by Mr. J. O. Montiganini, engineer with the electric department, and described the distribution system of the company.

The March meeting of the Chicago section will be given over entirely to entertainment. Dinner will be served at 6:30 o'clock, after which a program consisting of a number of musical selections will be given, and Mr. J. T. Mountain will take the members on a trip around the Mediterranean and up the Nile. Mr. Mountain recently made a three months' visit to this part of the world, and will show a hundred or more views.

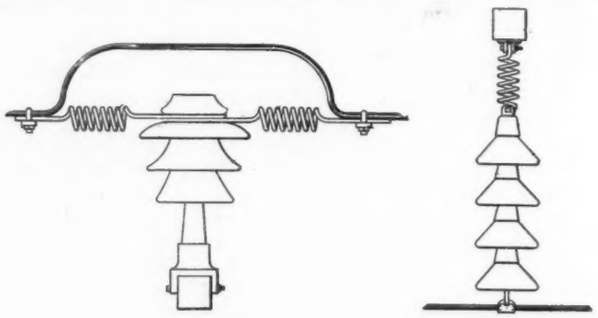
Ithaca A. I. E. E. Section.

The Cornell Branch of the American Institute of Electrical Engineers held its annual banquet Friday, March 5, at 6 p. m., in the Sibley College Club Rooms, with an attendance of about 75 members of the local branch. Mr. D. B. Rushmore, of Schenectady, was the guest of honor, and Prof. E. L. Nichols officiated as toastmaster. After an enjoyable menu a number of toasts were given. Professor Norris responded to the toast on "Speed Graphs or Acceleration on the Motor Curve," giving an interesting analogy between the speed control of the railway motor and the influence of the professor upon the working rate of the student. This banquet has become an established custom and adds materially to the enthusiasm of the members. After the banquet Mr. Rushmore addressed 125 members of the local branch on the subject of "The Application of Electricity to Steel Mills." The address was fully illustrated by lantern slides showing the various processes in the making of steel, including the mining of the ore, its transportation and unloading, conveyance to the blast furnaces; rolling, sawing and drilling of the steel product. Especial attention was directed to the use of the electric motor in these processes, and an excellent idea was given of the hard service and rugged nature of these powerful motors.

Prof. H. H. Norris has resigned the secretaryship of the local branch, and while he will maintain an active part in the work, the office of secretary has been filled by the election of Mr. B. C. Dennison, instructor in the electrical engineer department.

Protection of High-Tension Insulators.

In the accompanying illustrations are shown two forms of support for high-tension lines which are intended to protect the insulator against breaking down from lightning or any high-frequency discharge. The protective support consists of a steel-wire coil of high resistance and inductance inserted between the conductor and the earth. Fig. 1 shows the arrangement used with an under-supported insulator, while Fig. 2 shows



FIGS. 1 AND 2.—INSULATOR PROTECTION.

the scheme employed with an insulator of the under-hung type.

The above-described arrangements have been devised for reducing the charging current reaching the insulator during lightning or other disturbance, and thereby preventing the cracking of the insulators. A patent covering the combinations outlined herewith was issued on Feb. 9 to Mr. W. T. Goddard.

Steel Mill Engineers at Schenectady.

At the invitation of the General Electric Company, about 50 prominent steel mill engineers from all parts of the country met at Schenectady on the morning of March 9 for the purpose of making a study of the design and construction of electric apparatus, of particular interest in connection with steel mill work. The meeting continued over Wednesday and until the afternoon of Thursday.

During the visit of the engineers three meetings were held for the purpose of presenting and discussing papers. Mr. W. L. R. Emmett read a paper entitled "Steam Turbines." "Centrifugal Compressors" was the title of a paper by Mr. L. C. Loewenstein. A paper dealing with mill-type motors was presented by Mr. K. A. Pauly. Mr. H. E. White gave an illustrated talk on the design and operation of automatic control equipments. Lectures relating to the transmission of energy and the protection of circuits from lightning were delivered by Dr. C. P. Steinmetz and Prof. E. E. F. Creighton.

The visiting engineers were conducted through the factory to inspect the various types of apparatus described in the papers. The machines were shown in every stage of manufacture and in operation, under both normal and exceptionally severe conditions.

Municipal Ownership Checked in Massachusetts.

The Massachusetts Legislature has killed a bill to allow cities and towns to establish gas and electric light plants on a majority vote of the City Council and the voters of the municipality. The present laws require this vote twice in successive years, thereby safeguarding the existing investments in central-station property. The measure was reported adversely by the Committee on Public Lighting and was defeated in the House by a vote of 34 to 61.

Central-Station Extensions in Des Moines, Iowa.

With increasing demands for its service, the Des Moines (Ia.) Edison Light Company finds it necessary to make a considerable extension to its system. Accordingly, additions will be made to the steam generating plant, including a 2000-kw horizontal Curtis turbine and two additional water-tube boilers, with the condensers and pumping equipment to go with them. The necessary additional switchboard equipment will also be needed. Sargent & Lundy, of Chicago, are the consulting engineers for this power-plant extension.

Deterioration of Lead Sheaths.

In a paper recently read before a conference committee consisting of representatives of independent telephone operating companies, Mr. Thos. G. Spencer discussed the deterioration of lead sheaths of aerial and underground telephone cables. The author divided the causes for deterioration of the sheaths into six general groups, namely, mechanical injury, chemical decomposition, electrolysis, vibration, lightning, and impurities in the lead. In order to protect the cables from chemical decomposition and electrolysis it is desirable to build the conduit so that no water will ever lie in it—that is, the duct should slope from the middle both ways to the manholes; the joints should be absolutely watertight; electrical surveys should be made frequently and the cable should be grounded where necessary.

The effect of vibration is to crystallize the lead. Vibration may be caused by too much slack in the messenger, too little slack in the cable, the use of long spans, or by suspension from vibrating structures. The author exhibited several specimens of cable that had been injured by vibration, caused by the movement of trains over elevated and bridge structures.

Cost of Concrete Piles in a Power-Plant Foundation.

In a paper recently presented before the Boston Society of Civil Engineers Messrs. Sanford E. Thompson and Benjamin Fox gave the cost of driving cast reinforced-concrete piles for the foundation of the new power plant of the Boston Woven Hose & Rubber Company in Cambridge, Mass. The piles were 30 ft. 6 in. long, 14 in. square at the butt end and in general 9-in. square at the tip. The piles were reinforced with four ⅞-in. corrugated steel rods and loops of ¼-in. corrugated bars. The butts of the piles were extra reinforced by ⅜-in. to ½-i. steel rods.

The piles were made by a foreman and a gang of four carpenters, eight laborers and four steel men. The concrete gang mixed and placed concrete in 10 piles in 10 hours. The concrete was mixed by hand and the age of the piles when driven ranged from 30 days to 41 days. The piles were driven by a 4700-lb. hammer. The pile-driving gang consisted of a foreman, engineman, pumpman and seven helpers. The cost of preparing and driving, with all allowances, including pump hose, incidentals, connections and profit, was $1.25 per linear foot.

CURRENT NEWS AND NOTES.

MANTLE ARC LAMP.—A patent was issued to Mr. Isador Ladoff on Feb. 23 for an arc lamp in which use is made of a mantle, similar to that of a Welsbach gas mantle, which surround the arc and is heated to incandescence thereby.

TELEPHONE AND TELEGRAPH REGULATION IN NEW YORK.—A bill has been introduced in the New York Legislature extending the powers of the State Public Service Commissions over telephone and telegraph companies.

NEW JERSEY PUBLIC UTILITIES COMMISSION.—Owing to a contest between the supporters of rival bills for the establishment of a public service commission in New Jersey, it is predicted that neither bill will pass the present session of the Legislature.

PROPOSED PROHIBITION OF ELECTRICAL COAL MINING.—A new code, to regulate bituminous coal mining in Pennsylvania, which has been prepared by a commission appointed by Governor Stuart, will, if adopted, prohibit the use of electric power, according to the statement of coal operators. At a meeting held to protest against the code it was asserted that its provisions would require the removal of millions of dollars' worth of electrical machinery now in use.

POWER FORCED DRAFT NOT A PUBLIC NUISANCE.—Upon appeal, a Brooklyn court has reversed a decision which held a railway power house guilty of maintaining a nuisance, on the grounds that owing to the use of forced draft large quantities of small cinders and unburnt coal from the chimneys were distributed in the neighborhood to the discomfort of the residents. In reversing the lower tribunal the court held that the defendant does not contaminate the air with noisome and noxious vapor and gases, nor can it as well conduct its business in some remote place. The principle of a public nuisance cannot be upheld merely because particles of hard coal in place of black smoke were emitted from the chimneys.

TELEGRAPHERS STRIKE IN PARIS.—The telegraph and telephone operators employed in the bureaus of the postoffice at Paris went on a strike March 13, and according to last accounts the two services are badly muddled in consequence. The city is practically cut off from the rest of the world telegraphically and telephonically. Regarding the interruption to the London service, it is stated that the officials explain it as due to violent weather in the Channel. It is said that 6000 employees of the two branches of the service are out, and that the Government has ordered army telegraphers to Paris. The agitation also includes the railway mail clerks, and they and the telegraphers seem to be acting in sympathy with each other. A later dispatch from Paris states that the strike came to a sudden end on March 13, when the Government threatened instant dismissal, with the loss of State servant privileges, unless work was resumed.

GERMAN MARINE WIRELESS.—During a recent debate in the Reichstag, it was stated that of 167 German vessels fitted with wireless, 150 have Marconi equipment. The requirement of an English operator with Marconi outfits was criticized. In replying to the criticisms that German wireless systems were discriminated against, a Government official said that as the English wireless stations refused to communicate with ships having other than the Marconi system, the German ships had no other recourse than to install the Marconi apparatus. As England had not joined in the international agreement, English ships were not under any obligation to respond to a German vessel carrying another system. It would be a good thing, he said, to increase the number of vessels carrying the German system, but it would not be wise to emphasize too strongly the principle of nationality, since this might influence other nations to insist upon the installation of their systems.

CENTRAL-STATION SOLICITORS' HANDBOOK.—The executive committee of the National Electric Light Association has authorized the publication of a solicitors' handbook, which has been edited by Mr. Arthur Williams.

RIVER ILLUMINATION.—One of the recommendations of the Chicago Harbor Commission, which recently presented an important report on the subject of maintaining and improving Chicago's water-shipping facilities, was that the Chicago River be illuminated by electricity for navigation at night.

NAVAL 3000-MILE WIRELESS STATION.—After many delays the contract for the 3000-mile naval wireless station at Washington was awarded March 10 to the Fessenden Wireless Company. The work is to cost $182,600, including the erection of a 600-ft. tower at Washington and the wireless equipment of several vessels.

THE NEW ENGLAND WIRELESS SOCIETY was incorporated under the statutes of the Commonwealth of Massachusetts on Feb. 4 for the study and improvement of wireless communication. The regular meeting is held the first Friday in each month. Mr. Gordon S. Wallace, 563 Massachusetts Avenue, Boston, is acting secretary.

NEW MACKAY CABLE.—News comes from Boston to the effect that the Mackay Companies, through the Commercial Cable Company, will lay a submarine cable between New York and Newfoundland. It is stated that the new cable will reduce the transmission time to Europe 30 to 35 per cent. The cable will be about 1700 miles long and cost at least $1,500,000.

WEST VIRGINIA INDEPENDENT TELEPHONE ASSOCIATION.—The fourth annual convention of the West Virginia Independent Telephone Association will be held in Parkersburg, W. Va., on May 27 and 28, 1909, with headquarters at the Chancellor Hotel. Arrangements have been made for exhibits of telephone apparatus and material. Mr. W. C. Handlon, Wheeling, is secretary.

WIRELESS ELECTRICAL ENGINEER WANTED.—The United States Civil Service Commission will hold an examination April 21 to secure eligibles for a position as assistant electrical engineer, expert in wireless telegraphy, in the United States Signal Service. The salary will be $1,500 to $1,800 per annum. Information as to the various places of examination can be obtained from the United States Civil Service Commission, Washington.

BOARD OF TRADE TELEGRAPH COMPANY.—The Chicago City Council committee on gas, oil and electricity has recommended for passage an ordinance granting a franchise to the People's Mutual Telegraph Company, which intends to operate a telegraph system connecting Chicago, St. Louis, Kansas City and other cities in the Southwest. It is said that this telegraph company is backed by the Chicago Board of Trade.

NATIONAL CONFERENCE ON STANDARD ELECTRICAL RULES.—The seventh annual meeting of the National Conference on Standard Electrical Rules will be held in Room 8, Engineering Societies Building, 29 West Thirty-ninth Street, New York, on Friday, March 26, at 11 a. m. The meeting will follow that of the Underwriters' National Electric Association and action will be taken on the rules adopted by the insurance interests.

APRIL A. I. E. E. MEETING.—At the New York meeting April 9 of the American Institute of Electrical Engineers, two papers will be presented on the subject of high-tension transmission. One by Mr. K. C. Randall, engineer in charge of design of the Westinghouse Company, will treat of the design of high-voltage transformers, oil-switches and lightning arresters for outdoor installation. The other, by Mr. A. B. Reynders, engineer of the Westinghouse Company, will deal with a new development in the design of high-voltage terminals and bushings.

OMAHA ELECTRICAL SHOW.—The Omaha Electrical Exposition will open on May 6 and continue 10 days, closing May 15. It will be held in the Auditorium, a handsome and spacious building in the heart of the city, and among the features will be a new and attractive scheme of decorative lighting. The show will be given by the Omaha Electrical Exposition, a corporation composed of the electrical men of Omaha and Council Bluffs. Mr. J. N. Gillan, who managed the show last year, is also the manager this year.

EXTRA FEE FOR DELIVERY OF TELEGRAMS.—According to the Supreme Court of Indiana, a telegraph company doing business in that State may charge an extra 10 cents for delivering a message in a city at a point more than one mile from its office. The case came up in Indianapolis, where the Western Union Telegraph Company refused to deliver messages free in all parts of the city. The original statute relating to this matter has been in force 56 years, it is said, and is unreasonable now, according to the court's decision, because the city has grown far beyond its old boundaries.

BENEFITS OF COMBINATION.—In his article "When Does Profit Become Usury?" in the March *World's Work*, Dr. Alexander Graham Bell says: "Now it is noteworthy that, so far as the producers are concerned, combination means peace; competition, warfare. Competition means a mob, without organization, and weak for effective work; combination, an organized force, powerful and efficient. It is only necessary that this force should be controlled in the interests of the people as a whole in order to be beneficial in every way." Dr. Bell discusses unfavorably the plan of municipal ownership.

SUBURBAN TELEPHONE RATES.—The vexed question of suburban telephone rates has come up in Harvey, Ill., which is 20 miles from the center of Chicago and in the territory of the Chicago Telephone Company. The local exchange rate in Harvey for business telephones is $48 a year, and, in addition, the regular toll rate is charged for Chicago connections. Harvey is a manufacturing suburb, and the business men there assert that this toll rate places them at a disadvantage compared with business houses in competing lines in the city. Mr. B. E. Sunny, president of the Chicago Telephone Company, contends that the rates are justified. The suburban concerns escape city taxes, and they cannot expect, in equity, to be put on the same basis with city manufacturers. The toll-line service is expensive and the company is entitled to a reasonable profit on it. The Harvey men may lay their grievance before the Legislature.

NOON MEETINGS OF TECHNICAL SOCIETIES.—Noting, perhaps, the success of the Electric Club of Chicago in holding weekly meetings at a luncheon followed by a short address and brief discussion, the Chicago section of the Illuminating Engineering Society sought an expression from its members in relation to the question of holding the April meeting at noon. A letter ballot was taken on this subject, and at the meeting of March 11 the secretary, Mr. George Harvey Jones, reported that out of 60 responses 47 were in favor of trying the experiment and 13 were opposed to the innovation. The general opinion seems to be that there are so many technical and semi-technical societies at the present time that members feel that an undue proportion of their evenings is given up to attendance at the meetings. Therefore, the idea of holding some of them during the luncheon hour at noon was hailed with general approval. It is likely, therefore, that the April meeting of the Chicago section of the Illuminating Engineering Society will be held at noon. The subject to be discussed will be some aspect of illuminating engineering appealing more particularly to the gas-lighting members.

Motor Equipment of the Gary Rolling-Mill of the Indiana Steel Company.

THE new plant of the Indiana Steel Company, located at Gary, Ind., is notable not only on account of being the largest steel plant in the country, but because it has probably the largest application of electric power in a single industrial plant. A general idea of the electrical equipment was given in an article in *Electrical World* of Sept. 26, 1908, which illustrated the large gas-engine power house and contained an outline of the other electrical features of these mammoth steel mills. An abstract of a paper by Mr. B. R. Shover, electrical engineer of the Indiana Steel Company, delivered before the American Institute of Electrical Engineers, March 12, 1909, on "The Industrial Application of the Electric Motor as Illustrated in the Gary Plant of the Indiana Steel Company," is given elsewhere in this issue.

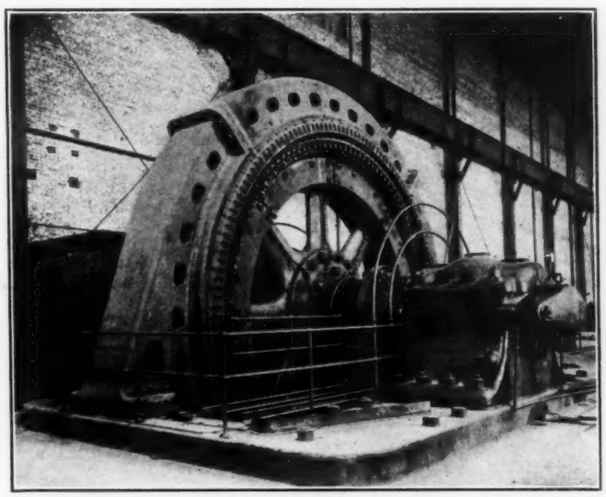


FIG. 1.—6000-HP RAIL-MILL MOTOR.

Although electricity is used for a great number of purposes around the plant, a considerable percentage of the output goes to the operation of rail and merchant mills, which are entirely motor-driven and which employ three-phase induction motors on a scale and of a size which make the driving equipment unique. The tables and transfers for handling the product through the mill and which operate intermittently are mainly driven by 250-volt, direct-curent motors which were considered to permit of greater ease of control than alternating-current motors.

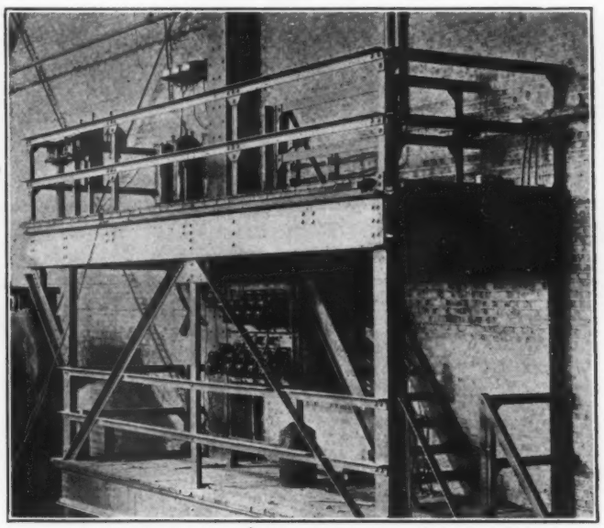


FIG. 3.—PULPIT CONTROLLING STATION FOR 250-HP RAIL-MILL LIFT.

Interest naturally centers about the large induction motors used for driving the main rolls of the mill. These aggregate 24,000 hp. They are of General Electric manufacture, 25-cycle, 6600-volt, three-phase. These large motors and their ratings are as follows:

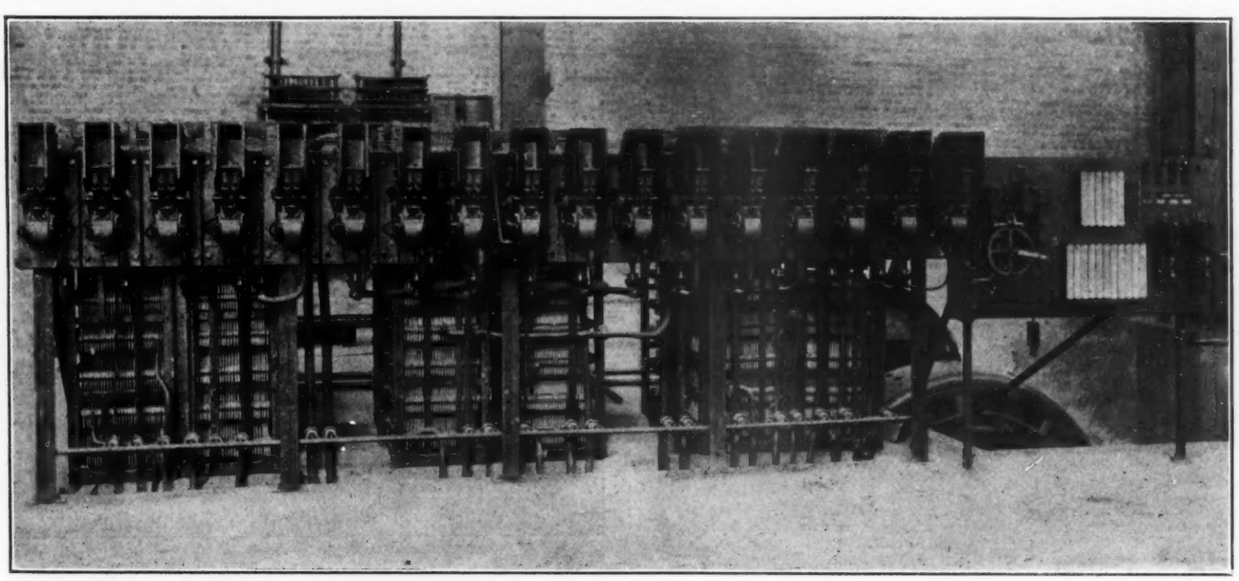


FIG. 2.—6000-HP MOTOR-BOARD AND STARTING APPARATUS.

The electric power for the operation of this gigantic plant is principally obtained from gas engines. The present plant has 34,000 kw in 2000-kw gas-engine units and 4000 kw in steam turbo-alternators. The steam units were installed for use during construction and in starting up. Of the total rating 30,000 kw is in 25-cycle, 6600-volt, three-phase alternators, and 4000 kw in 250-volt, direct-current generators.

Two 14-pole, 214-r.p.m. motors rated at 2000 hp with 40 deg. rise in temperature or 3000 hp for one hour at 60 deg. rise. These are provided with flywheels built up of laminated steel weighing 100,000 lb. each, and drive, through gearing, four 40-in. blooming-mill stands in the rail mill.

One 34-pole, 68-r.p.m. motor rated at 2000 hp continuous duty with 40 deg. temperature rise, and 3000 hp for one hour

at 60 deg. rise. This motor is provided with a flywheel built up of cast-iron sections adjusted according to the requirements of the mill after installation. This motor drives a 28-in. forming mill to which it is directly connected.

One 36-pole, 83.3-r.p.m. motor rated at 6000 hp with 40 deg. temperature rise continuous duty, with a rating for 9000 hp for one hour with 60 deg. rise. This motor has a flywheel of cast-iron sections of adjustable weight. It is directly connected to 28-in. roughing, second-edging and leading mills.

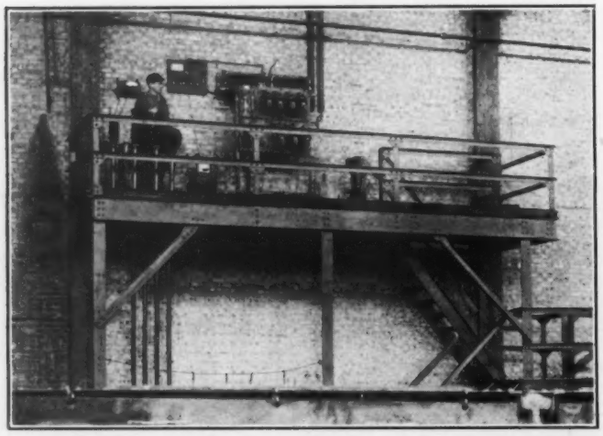


FIG. 4.—PULPIT CONTROLLING STATION, RAIL MILL.

One 34-pole, 88-r.p.m., 6000-hp motor with a continuous rating of 9000 hp for one hour with 60 deg. temperature rise. This motor has a built-up, cast-iron sectional flywheel and drives the 28-in. roughing dummy, first-edging, and finishing mills.

One 40-pole, 75-r.p.m., 6000-hp motor with 9000-hp rating for one hour with 60 deg. temperature rise. This motor has a cast-iron sectional flywheel of adjustable weight and drives the 40-in. three-high rolling mill directly connected. The cast-iron sectional flywheels are made adjustable in weight because the requirements cannot be determined accurately except by actual trial.

To prevent damage to the mill or motors by end thrust caused by the breaking of a spindle or roll, the motors are so arranged that when the end thrust exceeds 150 tons, two breakable rods attached to the bearing pedestal will give way, allowing the rotor to move away from the rolls and revolve freely. One of the 6000-hp induction motors with this feature is shown in Fig. 1. As will be seen, the motors are located in a separate fireproof room adjoining the rolling mill, a shaft extending through the wall.

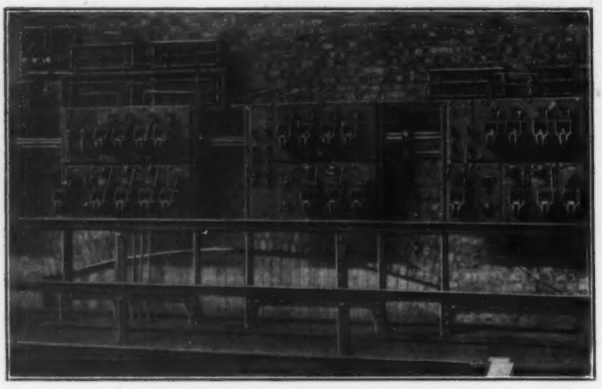


FIG. 5.—PULPIT CONTROLLING STATION, ROUGHING MILL.

In addition to the motors above mentioned, all of which drive the rail mill, there are to be two 2000-hp motors and three 6000-hp motors in the billet mill, and two 3500-hp motors in the merchant mill. The 6000-hp motors have a power factor at rated load of about 87 per cent, which increases to about 92 per cent at 9000 hp.

Of course the fluctuations in load on these motors are extreme. To keep down the fluctuation of current which will occur in spite of the large flywheels, means have been provided for automatically introducing resistance into the secondary circuits of these motors when the speed decreases by 2 per cent or 3 per cent. The resistors are connected in multiple-delta and contactors acuated from 220-volt relay circuits open and close the circuit through the resistors so as to vary its value. As the load comes on the motor, the resistance is automatically introduced into the rotor circuit and withdrawn after the load goes off. An overload relay in the main motor circuit causes the cutting in of resistance when the load exceeds a certain amount. Fig. 2 shows the secondary resistors and the contactors.

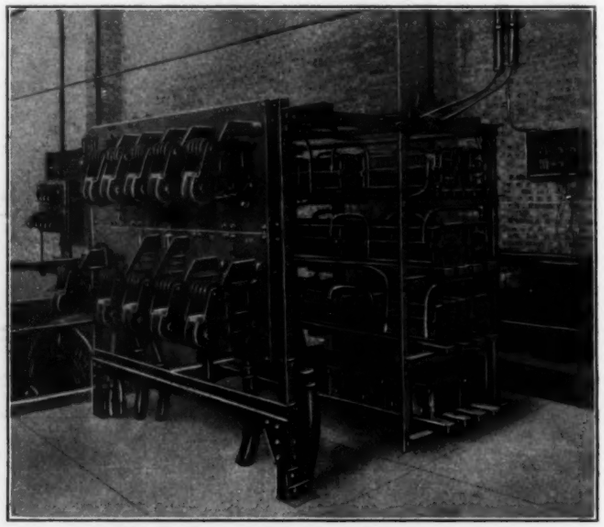


FIG. 6.—250-HP MOTOR-BOARD.

The main motors for driving the rolls are started and stopped by remote control from the pulpits in the rail mill proper, although the motor attendant in the motor room can bring them to rest independently of the master controller on the pulpit in case of emergency. The contactors and resistors for the control of the large motors are located in the motor room.

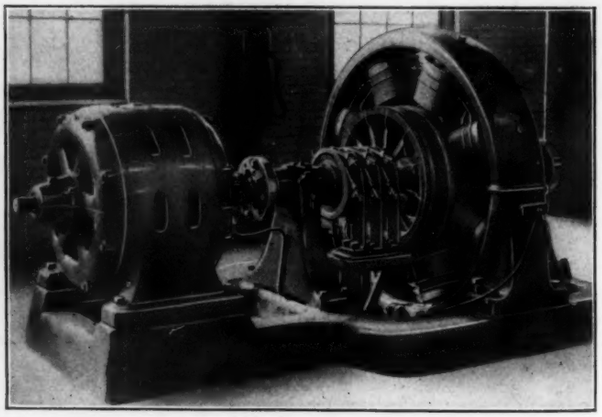


FIG. 7.—EXCITER FOR SPLIT-POLE ROTARY.

Some nice problems in motor control came up in connection with the movement of the product through the mill. For the transfers, lifting tables and ingot buggies use is made of 250-volt, direct-current motors. Motors for driving saws and drills which operate continuously (and hence present no special problems in control) are of the three-phase induction type, operated from step-down transformers at 440 volts. Con-

trollers for the various direct-current motors in the rolling mills and for the smaller induction motors are of the Cutler-Hammer Manufacturing Company make.

There are 59 remote controllers of various kinds in use on these smaller motors in the rail and finishing mill. In the rolling mill proper there are 21 table and two transfer motors. The principle employed in all of the controllers for this character of work is that of automatically limiting the starting current and rate of acceleration by means of series relays on each contactor. These series relays prevent each succeeding contactor from short-circuiting its step of the resistor until the current and torque have fallen below the amount for which the relay is set. The operators in the various pulpits in working their master controllers are therefore unable to vary the rate of acceleration. They simply move their master controllers to certain points and the series relays and contactors control the acceleration.

Fig. 3 shows a pulpit controlling station for a 250-hp motor operating a lift in the rail mill. The contactor board of the motor controller in this case is located immediately under the pulpit, since the motor is near by. In other cases the contactor board may be some distance from the master controller. Fig. 4 shows a pulpit from which the operator controls the hot saws, which are operated by 440-volt induction motors.

The tables that raise and lower the rails to the saws are worked with direct-current motors fitted with controllers whereby the operator sets the handle at a certain point, and the complete cycle of raising and lowering the table is accomplished without change of controller. This action is accomplished by master-control circuit contacts which are made and broken by the movement of the table.

Another interesting application of automatic control is in connection with the ingot buggies, of which there are two, operated from a pulpit. To prevent collision, the controllers are interlocked so that both buggies cannot be brought to the center at the same time. One buggy operates north of the table and the other south of the table, each serving six rows of four pits. These buggies can be stopped at any pit automatically, so that all the operator has to do is to set the controller on the point corresponding to a certain pit. When opposite that pit the buggy opens a switch, which in turn opens the master-controller circuit. This action drops the contactors that close the main circuit to the motor and closes a series braking circuits through the motor.

Figs. 5 and 6 give a good idea of the solenoid-operated contactors or contact makers and grid resistors controlling the direct-current mill motors.

The estimated combined load of the various motors on the rail mill in full operation shows variations from 4400 hp to 19,000 hp. Other motors about the plant in hoisting work also cause a very fluctuating load. To even up these fluctuations on the power plant two sets of storage battery, each of 125 cells, have been installed, to charge into or discharge from both the alternating-current and direct-current systems.

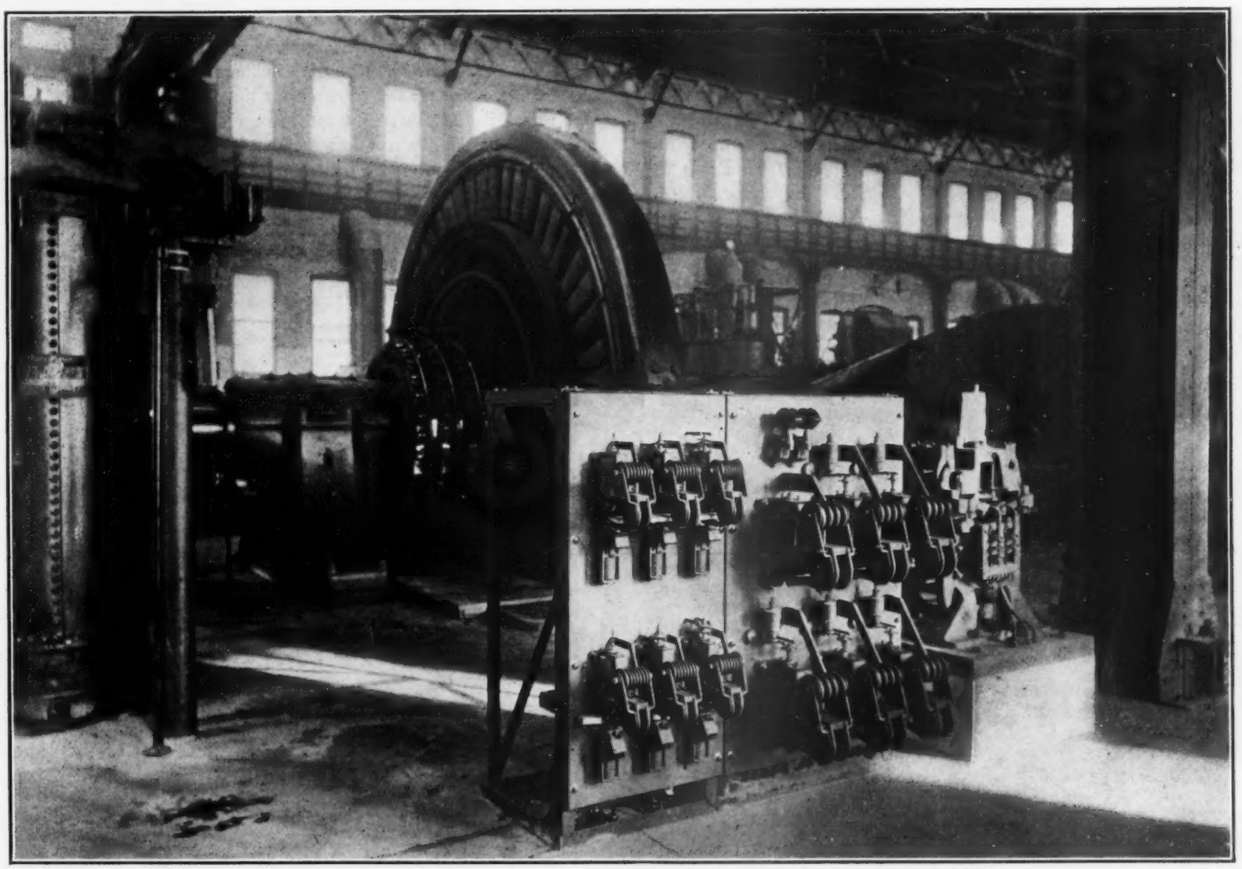


FIG. 8.—SPLIT-POLE ROTARY AND STARTER.

The alternating-current charge and discharge are to be accomplished by two 18-pole, 2000-kw, split-pole rotary converters, one of which is shown in Fig. 8. The peculiar characteristic of these split-pole converters is that by varying the field excitation of the different poles, the commutator voltage can be made to vary independently of the slip-ring voltage of the converter. Thus, although the alternating-current voltage is kept constant, the batteries can be made to charge from or discharge into the alternating-current system by means of the converter.

To vary the field excitation on this split-pole converter use is made of a motor-driven exciter of the type described by Mr. J. L. Woodbridge in his paper on "Storage Batteries" before the 1908 A. I. E. E. Convention at Atlantic City. This exciter is explained and its circuit diagrams given on page 85 of this journal dated July 11, 1908. Fig. 7 shows this exciter driven by a synchronous motor. The starting board of the split-pole

rotary converter is shown in Fig. 8, in which can be seen the solenoid-operated contactors which short-circuit the direct-current resistors in the circuit from which the converter is started. After this rotary converter is brought up to speed, a 10,000-amp, direct-current, solenoid-operated switch (seen at the right in Fig. 8) is closed, so that the charge and discharge from the battery through the rotary pass through this switch and relieve the rheostat contactors of the load. This rotary converter, like the direct-current motors, is started by remote control with automatic current limiting series relays to operate the contactors in the main circuit.

For the foregoing information and illustrations pertaining particularly to the motor equipment of the rolling mill we are indebted to the courtesy of the officers of the Indiana Steel Company, and also to the Institute paper by Mr. B. R. Shover.

Electrical Engineering Features of the Alaska-Yukon-Pacific Exposition.

By A. T. Quigley.

THE stated purpose of the Alaska-Yukon-Pacific Exposition, which will be held at Seattle, Wash., from June 1 to Oct. 16, 1909, is to exploit the resources and potentialities of Alaskan and Yukon territories in the United States and in the Dominion of Canada; to make known and to foster the vast importance of the trade of the Pacific Ocean and the countries bordering thereon.

The site selected covers 250 acres, belonging to the University of Washington, which will make use of many of the buildings after the exposition closes. The State of Washington has appropriated $600,000 for university buildings and $400,000 for State buildings at the exposition. The Government has appropriated $650,000 for representation, while the citizens of Seattle have purchased $1,000,000 of stock in the exposition. The work on the buildings has progressed so rapidly that it is stated that the fair will be ready on time.

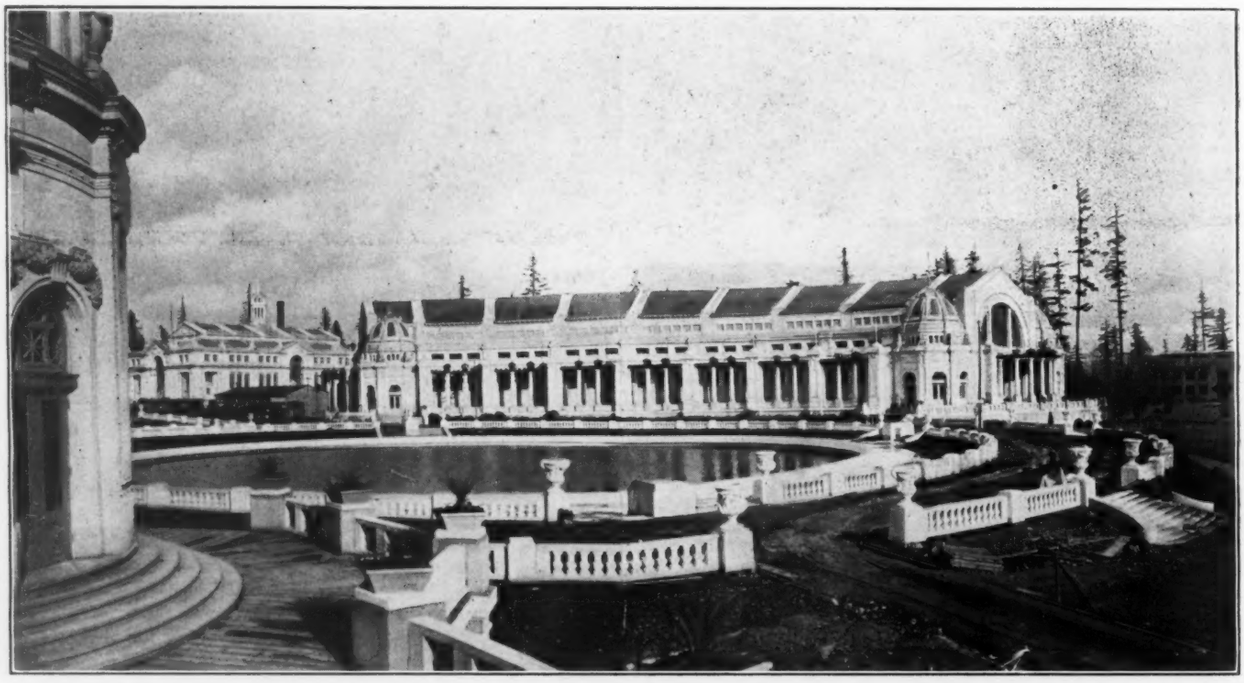


FIG. 1.—VIEW OF CENTRAL COURT, NEW ENGINEERING BUILDING AT RIGHT.

The exposition will possess many features of particular interest to electrical engineers. The more prominent of these features can be grouped into five divisions, as noted below:

TRANSPORTATION FACILITIES.

The exposition is located about five miles from the business center of Seattle. Practically all of the electrical railway systems of the city and surrounding territory are owned by the Seattle Electric Company, a corporation under the control of the Stone & Webster Engineering Corporation, of Boston. This company has found it necessary in anticipation of the unusual loads that will be thrown upon its system during this next year to make extensive additions to the generating station, substations and rolling stock. During the last two years this company has been carrying on extensive track construction operations, adding to its generating equipment and purchasing new cars. A lump order for 140 cars, to be delivered before the opening of the exposition, was placed with the St. Louis Car Company some time ago. It is estimated that in anticipation of the exposition crowds, and on account of natural growth of business, the Seattle Electric Company has during the last two years expended almost $1,750,000. While it is in no ways likely any large proportion of this expenditure will be returned during the exposition period, it is certain that the Seattle Electric Company is making an effort to handle, if possible, all of the transportation business, although a steam road passes directly through the exposition grounds. In all, the railway company will have six double-track lines available for handling the exposition crowds and arrangements are now being made whereby loop facilities will be obtained for each of these tracks so as to move the traffic more expeditiously.

An attractive feature of exposition travel will be the combined street car and water routes made possible by the location of the exposition upon the shores of Lake Washington. From the center of town three cable lines run up the steep hills over to Lake Washington, and from these points passengers will be regularly handled by adequate boat service, which even now is extremely popular with the public.

This combined street car and water route to the fair will be particularly attractive to out-of-town visitors and will be of great assistance so far as satisfactory handling of crowds is concerned, both to the electric railway company and to the exposition management because of the distribution that will result.

ELECTRICAL EQUIPMENT.

The Seattle Electric Company has obtained the contract for furnishing all industrial and lighting service to be used in connection with the exposition enterprise. For the proper handling of this load there is being built on the fair grounds a substation which will be completely equipped. In this station will be the following apparatus:

Two 1000-kw motor-generator sets, with 13,000-volt, three-phase motors directly connected to 600-volt generators; four 1000-kw, 13,800-volt to 23,000-volt, air-cooled transformers, with regulators and controlling oil switches; one 13-panel switchboard complete for handling the various voltages for motor and lamp service.

Special interest is attached to this station because the energy

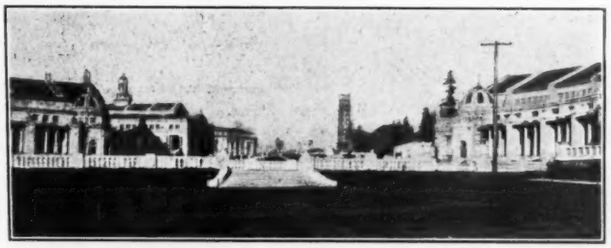


FIG. 2.—AT FOOT OF "COURT OF HONOR."

that is brought in on the primaries will, for the most part, come from the generating station located 50 miles away on the Snoqualmie River. When the river cannot furnish sufficient power for all needs, the modern steam-turbine station recently completed at Georgetown will be connected to the line.

The growth of the university has been so rapid that the old generating station equipment has been outgrown. A new station was, therefore, built nearer the Lake Washington shore and

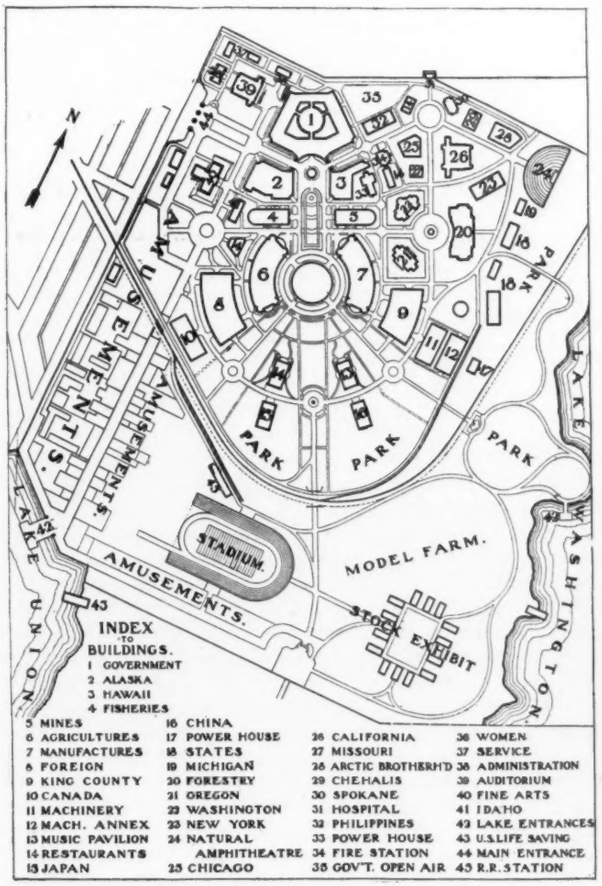


FIG. 3.—PLAN OF EXPOSITION GROUNDS.

provisions have been made for all necessary lighting and heating of the university buildings, even for some time to come. The station contains the following equipment: Two 250-hp Parker water-tube boilers; two Green Engineering Company link grates; two American Steam Pump Company boiler feed pumps; one Cochrane feed-water heater; one McEwen simple engine directly connected to a 100-kw, three-phase, 2300-volt Westinghouse generator and exciter; one McEwen simple engine directly connected to a 200-kw, three-phase, 2300-volt Westinghouse generator and exciter.

During the exposition this station will not be utilized to any considerable extent, at least in connection with the exposition buildings, although whatever heat is necessary will be fur-

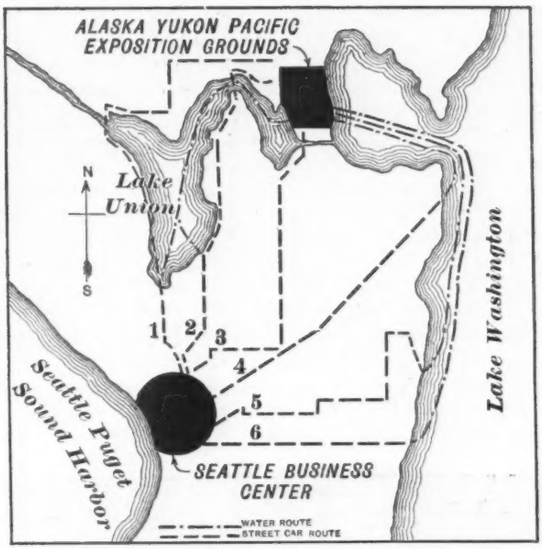


FIG. 4.—LOCATION OF EXPOSITION GROUNDS.

nished from this source. The energy for the lamps and motors, however, will be furnished by the Seattle Electric Company.

LIGHTING.

From the substation energy will be carried about the grounds to the various buildings, either by underground system or by the trunk-line system which extends around the outside of the grounds or, in many cases, by a combination of both. All of the buildings on the exposition grounds have been brilliantly lighted with 8-cp frosted incandescent lamps. On those buildings immediately surrounding the Cascade Court there will be

FIG. 5.—MANUFACTURES BUILDING, SHOWING SCHEME OF DECORATIVE LIGHTING.

a total of approximately 40,000 lamps. The buildings for which the exposition management is responsible, including the street and park lighting, will require about 100,000 lamps. The Government and State buildings will nearly duplicate this amount, while miscellaneous requirements will undoubtedly

bring the grand total up to approximately 250,000 incandescent lamps.

It has been arranged that the total decorative load shall be handled through a suitable rheostat so that when the lamps are turned on at night the whole system will be gradually brought up from darkness to full brilliancy. The decorative lighting has been handled as far as possible in such a manner as to bring out the architectural features of the buildings. The outlines have been accentuated and a great deal of soffet and concealed lighting giving indirect illumination has been devised. An unusual difficulty was encountered in carrying out the decorative scheme uniformly on all the buildings because several of the structures are of the permanent type and must be turned over to the university after the close of the exposition and in nowise injured by exposition use. Special provision had to be made, therefore, in order to attach to the brick and terra-cotta work, of which these buildings are constructed, the thousands of incandescent lamps necessary for proper decoration. This result was accomplished by inserting, at convenient intervals during the erection of the permanent buildings, copper tie wires and to these the decorative lamps will be attached in strips.

Special attention has been given to the lighting effects around the cascades and geyser basin. Behind each one of the six falls of which the cascades are composed will be lines of lamps extending the entire width, which, when lighted, will give the rainbow effect shining through the falling water. Around

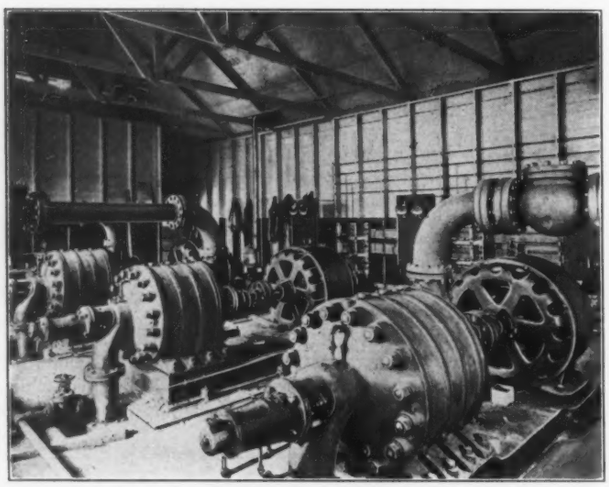


FIG. 6.—EXPOSITION PUMPING STATION.

the geyser basin, concealed from view, and in the bottom of the basin will be hundreds of incandescent lamps which the motion of the water will bring out in full beauty.

For lighting the grounds a special type of electrolier has been designed. The electrolier will be made up of an ornate staff column surmounted by a large staff ball, on the face of which will be attached 40 20-cp incandescent lamps so spaced on the ball as to give the best illuminating effect.

In the preparation of the grounds the trees and shrubs have been left standing so far as this was possible. In many portions of the grounds, therefore, and especially bordering on Lake Washington, natural park effects have resulted. In order to bring these parks into prominence at night it is planned to string thousands of lamps through the trees and along the paths.

WIRELESS TELEGRAPHY AND TELEPHONY.

For over a year a complete wireless telegraph station, controlled by the United Wireless Company, has been in commercial operation on the campus of the university. This station receives messages regularly from out-going and in-coming vessels and handles work from Alaska. During the exposition this station will be in operation as usual.

The wireless telephone will be demonstrated on the grounds of the exposition. Near the main entrance will be built a rustic tower 100 ft. in height in the base of which will be an exhibit hall for wireless apparatus of all kinds. Wireless telephones will be installed on the grounds and daily demonstrations will be made by the United Wireless Company. The wireless equipment will be installed on the top of a 50-ft. pole standing on this tower, giving a total height of 150 ft. It is planned to publish a daily newspaper containing messages from vessels at sea and news received by wireless.

MOTOR-DRIVEN PUMPS.

When the exposition work was started it was proposed to utilize for fire protection and general service purposes the water system of the city of Seattle. As the time approached for the opening of the fair, however, it became apparent that the city mains would not be extended in time to take care of this extra territory and, therefore, a complete pumping plant was rendered necessary. Upon the shore of Lake Washington a suitable pumping station has been built and installed therein is a complete pumping plant consisting of three Worthington centrifugal pumps, each capable of delivering 1000 gal. per minute, connected to Westinghouse 2200-volt, two-phase, 60-cycle, 200-hp motors. The intake crib was located some distance from the shore line and running to this crib from the pump station are three 7-in. intake pipes, it being considered best to provide each pump with its own intake. To further secure the plant against uninterrupted service, a double 12-in. main line extends from the discharge end of the pumps to the center of the fair grounds, from which point distribution is made. Wood stave pipe, manufactured by the Pacific Coast Pipe Company, has been used throughout the installation with the exception of within the pumping station proper.

For the purpose of operating the cascades and the fountains in the cascades and geyser basin, two large pumps of the Kroug Manufacturing Company's make, of San Francisco, have been provided and these will be driven by electric motors. The cascades will consist of six falls and the main supply of water for operating these falls will be delivered at the head of the cascades at the average rate of 10,000 gal. per minute. Here again the wood stave pipe has been used, in this case, however, designed for low pressure only.

Under the supervision of Mr. Frank P. Allen, Jr., director of works, the grounds, buildings and the utility systems are now practically completed, only such work as is to be done by outside interests being in an uncompleted state.

A Phase of the Patent Situation.

By James T. Barkelew.

IT may seem superfluous to discuss the general principles of the patent law as practised in this country, but as it has a vital bearing on the subject matter of what will follow it would seem best to make a brief résumé of the inherent fundamentals.

The granting of patents is in the nature of a contract, the two parties to the contract both receiving and giving. To form a starting point for the contract it is assumed as true that the inventor is possessed of an invention that is his property and that he may do with it as he chooses, just as with any other property. This fundamental fact has been disputed by some writers on the principles of patent law, on the ground that the individual owes something to the society in which he lives and from which, in a large degree, he draws his intellectual life; and although it may be, and probably is, theoretically true that our present system is partially false in its basic conceptions, it is nevertheless practical and productive of the present phenomenal industrial activity and commercial position in this country.

Taking the assumption of personal ownership as the starting point, it is obvious that the inventor may keep his invention from the public if he should so wish, and this is what would happen in the majority of cases if there were no patent law. The public would then never come into possession of the invention except by accident or negligence of the inventor in his

precautions for secrecy. To put the inventor in a position where he may without fear disclose his invention to the public, so that in the end the public may be the richer, the patent law provides for its exclusive control by the inventor for a length of time which is deemed sufficiently long to enable him to be appropriately remunerated. The public thus agrees to forbear for a definite length of time from interference with the inventor and his invention, and in consideration of this fact the inventor discloses to the public the full nature and scope of the invention. The benefit enjoyed by the public is the right to use the invention at the end of the period of protection given to the inventor.

The above is the principle of operation of the present system; it is good so far as it goes, but there is one point of vital concern which is ignored, to the detriment of the public and the false reward of the inventor. The system does not take into account what the inventor does with his invention during the period of monopoly, and he may consequently let it remain idle and thus deprive the public of whatever benefit might accrue from its use; for the public is benefited greatly by the use of a good invention even under the conditions imposed by the inventor. The large majority of the patents issued are left in this state of inactivity. In fact, the market is now glutted with inventions, the means for exploiting them being correspondingly scarce. Patents are being issued at the rate of 30,000 a year and it is obviously impossible to exploit all of these. Besides the consideration that there is not sufficient available capital for such a purpose, there is an economic limit to the speed at which changes may take place, this limit being at the point where the cost of change entirely offsets the benefit accruing from such change. This last reason probably is the real one for the inactivity of the large majority of patented devices.

Whatever the reason for the non-working, the present practice affords opportunity for a stray inventor to have a hold on an art in which he has no real rights and standing as compared with the inventors and patentees who make practical inventions and put them into practical use. In fact, there are many applications made for patents on the ground that the issuing patent may cover some valuable future improvements in its art and thus force the payment of royalties from a subsequent inventor. These applications are usually supported by a device which is crude or which is inherently wrong in the construction of a vital part, but which is theoretically good enough for the basis of letters-patent having claims so broad as to cover a large territory in which subsequent development is sure to take place.

As a result of this policy the public has a large amount of wealth tied up without receiving any returns. It might be argued that the public is none the poorer as it has given nothing which it formerly possessed, merely guaranteeing the right of the inventor to his property. However, the public is the poorer because the inventor is not removed and distinct from the State but a part of it, drawing just as much benefit from it as anyone else. The needs of the public are usually the circumstances which foster the invention, and it is almost always true that a needed invention will eventually be forthcoming. Thus the inventor is greatly dependent upon the public for the working out of his inventions. Put him on an isle by himself and he would probably invent nothing. Put him in a public in need of a particular invention and he will devise it sooner or later. Moreover, it is never the inventor who does all of the work leading up to a successful invention; the foundations have been laid by some investigator, or more usually a number of them, the inventor merely putting the results into practical use. Sometimes it may even be said that the inventor is merely an adapter of the ideas which have been worked up by the public around him. In this case the public is surely entitled to some consideration and the invention should not be given unconditionally to the inventor. It also may be that there are several inventors working on the same invention, and this is almost always the case where the invention is particularly valuable, so that the question of whom the exclusive rights belong to depends merely on which inventor has the keenest and fastest brain or the best mechanical equipment. The public gives to one of its members the exclusive and unconditional right to an invention which would have appeared shortly, even if the first inventor should have died before finishing his work. This inventor may then keep the public from the use of the invention which it would have had whether he had appeared on the scene or not.

The present system of laws is at fault in this particular point, and the people in the United States seem to be the only ones who have not awakened to this fact. In other countries there are bars, more or less effective, to prevent the inventor allowing his monopoly to remain idle, and these bars tend to keep the public clear of any unprofitable obligations and also to keep the field of invention clear to future inventors who would improve in any particular line. In this country there are thousands of patents which have never been put to use in any form, and those thousands of patents simply encumber the ground over which an inventor must go in order to make any improvement in any field. Experience has taught that there are cases innumerable in which an inventor who has accomplished practical results has been prevented from the use of his invention by an old patent which is so impractical that it could not be used, and which has therefore been allowed to remain idle.

To inventors in the European countries the United States is noted for the absence of any taxes or workings in connection with patented articles. In their own countries foreign inventors are compelled to pay an annual tax and to perform continuous working of the invention covered by a patent—in other words, to supply the public with the invention in order to continuously enjoy their protection. At present about 75 United States patents are issued weekly to residents of foreign countries, and the total number of patents issued to foreign inventors and in force at the present time is probably somewhat in excess of 40,000. It is well known, from our own experience with foreign patents, that a very small portion of the patents issued to foreign inventors is ever worked in even the smallest degree. The issuance of the large majority of these patents to foreign inventors virtually means the signing away of so much wealth without any prospect of returns. Naturally, some of the patents are issued for impractical machines and these are the ones first to fail of actual working, but it must be remembered in this connection that, as a rule, foreign patents are not taken out on devices until their worth and merit have been proved to at least some extent.

When our own inventors receive patents from foreign countries it immediately becomes incumbent upon them to pay the annual taxes prescribed and to begin the working within the specified time limit in order to prevent their protection from becoming void. In the large majority of cases the patent does not run to the full extent of the term allowed by the law, but lapses on account of failure to keep up the taxes or the working; this is not on account of the worthlessness of the devices covered by these patents, but on account of the extreme difficulty experienced by the unknown inventor in securing the services and co-operation of someone capable of handling his invention. This same difficulty is in the path of foreign inventors who obtain patents in this country, but their failure to secure the desired services does not mean the lapse of their rights under the law. Thus, by our own policy, we put our own inventors into an unfair position, giving rights to foreign inventors with which the advantages enjoyed by our inventors in other countries is not comparable.

A single change in our present system would eradicate this growing injustice to our public at home and to our inventors abroad. The adoption of a system of taxation or of compulsory working, or both, would render invalid a large number of patents which are now just so much encumbrance to the progressive and practical inventor and to the public whom this class of inventor will vastly benefit. This result is accomplished in other countries and can be done here by proper provision, taking into account the peculiar conditions now existing as the result of the past patent practice. A law to com-

pel the reasonable working of a patented device, and the forfeiture of protection for failure to comply, would remove all of the dead material from the field and give to the inventor who is of benefit to the public a larger opportunity than is now afforded.

In the European countries different combinations of taxes and workings are used with varying success. In some of the countries taxes have been depended upon to invalidate an invention which is not being worked, the theory being that the patentee will not be willing to pay taxes on an invention which is not bringing him returns. In other countries working is the prime feature and the taxes are considered auxiliary in their effect. In these countries the construction put upon working varies, but it is usually based upon the fair supply of domestic demand by domestic effort. In some countries there are laws directly prohibiting importation, while others leave the relation of importation and home manufacture to be decided by the courts.

In combination with compulsory working, taxes are apt to degenerate into a mere revenue source and gradually fail of their intention. Taken by themselves without the working, it is questionable whether they accomplish all of their purpose, and there are some possible directions in which they may do positive injustice. For instance, the cost of patenting an article is so increased that the poor inventor is denied, to a greater or lesser degree, the privileges enjoyed under a non-taxation system; his wealthy co-worker, however, may pay his taxes even if his invention is not a commercial success. In this way the purpose of the scheme may be partially or wholly frustrated. Moreover, the expectation of future returns may and will induce many patentees to pay the imposed taxes for some years, in some cases to the end of the lawful term. Under other circumstances, where the patentee anticipates no future emoluments, the taxes will not be paid on inventions that may finally prove to be of large value. In all of these cases there will be injustice done, either in that the patentee holds for himself what should be the property of the public, or that he dedicates to the public something of value which should rightly be his own.

The only solution of the problem which seems to afford relief is that offered by a judicious application of compulsory working. In general, it may be said a meritorious invention will be worked, and the law compelling working should be so enacted that it allows the inventor every opportunity to comply with its provisions under the circumstances in which he is placed. If there are any notable exceptions to the general conditions, they should be provided for, so that the inventor does not lose his property through the action of agencies beyond his control. Every facility should be accorded the conscientious and diligent inventor for being reimbursed in a fitting measure for his labor, while it should be the direct aim to revoke the monopolies bestowed on the casual inventor who does nothing to exploit his property. The technical method of invalidating the patents would depend on considerations of efficiency and simplicity. There are two main ways open, one in which proof of working would have to be filed periodically, and the other in which the initiative would depend on the interested parties filing a request for cancellation. In either case the amount of labor involved would be well paid for by the liberating of rights to the public and the cleaning up of the field for progressive and practical inventors.

CENTRAL STATION

MANAGEMENT, POLICIES AND COMMERCIAL METHODS

Central Station Relations with the Public.

The manager of a central station noted for its successful conduct writes that one of the fundamental policies of the management has been to attract and to deserve the confidence of the public. One feature of this policy has been to maintain with the public a personal relation as contrasted with an impersonal corporate one. The good will thus acquired has been an asset in various ways, and notably in protecting the company against unfair competition by the local gas interests, and in having prospective builders include in their plans provision for house wiring.

Lost and Unaccounted-For Energy.

The percentage of electrical energy which is lost and unaccounted for between the busbars of a central station and a consumer's meters differs greatly among different companies. On some carefully managed direct-current distributing systems the percentage lost and unaccounted for is reported as low as 15 per cent. On the other hand, some alternating-current distributing systems in scattered territory, with a large number of very small transformers and with meters poorly looked after, show lost and unaccounted-for energy amounted to 70 per cent of that generated. It is impossible to say what the amount should be in a system under good management, unless the conditions are fairly well known. The lost and unaccounted-for energy depends on some conditions which are avoidable and on other conditions which are unavoidable. Among the avoidable conditions may be named failure to properly test and adjust consumers' meters, excessive loss in lines (which also causes poor voltage regulaton) and the use of numerous small transformers on an alternatng-current system where fewer large transformers would be better. Among the unavoidable conditions may be the necessity of operation in a scattered residential territory where a large number of transformers must be installed with only one or two houses connected to a transformer and the necessity of operating over long periods with little or no load, so that the transformer core and meter shunt losses are a larger proportion of the total output than if the system were better loaded. The condition of operating at almost no load all day and a part of the night may be unavoidable, but in many cases can be partially remedied by securing a load during these light-load hours. To judge from the figures of various central-station companies on this matter of lost and unaccounted-for energy, a company operating a direct-current distribution can consider it is doing excellent work if its losses are from 15 to 20 per cent, while on an alternating-current distribution losses of 20 to 30 per cent represent good practice. Conditions of scattered consumers on light load may necessitate greater losses than this, but such conditions a company should try to correct as far as possible. With plenty of day load, large transformers, meters kept accurate and low line losses, the lost and unaccounted-for energy on an alternating-current distribution should not be over 20 to 25 per cent. One occasionally hears of some remarkably low figures, but they are so uncommon as to raise the suspicion that they are due to the station output meters being slow.

Small Motors for Office Use.

Small electric motors are used to an increasing extent for operating the various labor-saving devices which are becoming a feature of modern business-office equipment. In the aggregate it is probable that the demand for small motors for this purpose, and for electric energy to operate them, will be considerable, and therefore the tendency is not only of interest to central-station managers, but it deserves active encouragement.

A representative of this journal visited the tenth annual Business Show, held in Chicago last week, with the idea of ascertaining if electric motors were used to some extent for the purpose of driving the newer labor-saving office appliances

exhibited there. He was pleased to note that this was in fact the case. Where devices are of such a character that hand labor can be advantageously replaced by some mechanical source of power, the electric motor appears to be, and of course very naturally, the only method of driving considered. This applies to adding machines, automatic card-printing presses, folding machines for letters and circulars, the multigraph letter printer, sign-printing or lettering machines, letter printers, automatic envelope sealers, automatic circular printers, addressing machines, machines that seal, stamp and count the envelopes of the outgoing mail, writing-adding machines and humidors for moistening the air.

In addition, a motor-driven automatic screw machine was exhibited, although this can be scarcely classed as an office appliance. This is also perhaps the case with the Thor electric washer and wringer exhibited by the Hurley Machine Company, of Chicago, and the miniature desk telephone booth shown by the Miniature Desk Telephone Booth Company, of New York.

Among the Business Show exhibitors who attach small electric motors to their machines, and whose work in extending the use of these machines, many of which are very ingenious, are thus of some importance to electrical men, are the following named:

American Multigraph Sales Company, Cleveland, multigraph letter-printers and folding machines; Elliott-Fisher Company, Harrisburg, Pa., writing-adding machines; Schermack Mailing Machine Company, Detroit, envelope sealer, stamper and counting machine; Rapid Addressing Machine Company, New York, addressing machines; Buffum Tool Company, Louisiana, Mo., automatic office printing press; Simplex Manufacturing Company, Granby, Conn., automatic envelope sealer; automatic Letter Machine Company, Chicago, letter printer; American Signotype Company, Chicago, sign or placard printing or lettering machine; Sanifacient Humidor Company, Chicago, humidor; A. B. Dick Company, Chicago, automatic folding machine; Burroughs Adding Machine Company, Detroit; S. V. Feuerstein Company, automatic card-printing press.

Central-Station Publicity.

Mr. Homer E. Niesz, of the Commonwealth Edison Company, Chicago, delivered an interesting address on "Central-Station Publicity" at a meeting of the Electric Club of Chicago on March 10. Considering publicity in a broad sense, Mr. Niesz said that his company was spending perhaps $150,000 a year for this purpose. This publicity takes various forms. The greater part of the money, about $85,000 a year, is spent in newspaper and street-car advertising. This advertising is handled by an advertising committee of the central-station company, assisted by an advertising agency.

Such subjects are advertised as the wiring of houses, electrical appliances in the home, general lighting and small motors for stores, and electric power for factories. Live subjects are handled in the "ads," and a feature made of pictures having the "human interest" element. The company also advertises through its own publication, *Electric City*, a handsome monthly magazine distributed free and mainly through drug stores. The purpose of this paper is to make the various applications of electricity and the name of the Commonwealth Edison Company veritable household words in Chicago.

Illuminated billboards and electric signs constitute another form of advertising. A very large and conspicuous roof sign is mounted on the roof of the Harrison Street station, and it sets forth briefly points about the use of industrial power in an important manufacturing region on the West Side. The name of a large power user is a part of this sign, and this feature is changed from time to time. The firm named may be considered as a sort of a reference for the use of electricity in factories.

Demonstrations of electric heating and cooking are made in different stores throughout the city. A portable booth is furnished for grocery stores, the plan being to have this booth in one store for a week at a time, as an attractive center for demonstrations of useful appliances for the housewife.

A showroom is located in the Adams Street building of the Commonwealth Edison Company, and is a great help to the business-getting department in making available for the inspection of prospective customers various electrical devices. The new Electric Shop, at Michigan Avenue and Jackson Boulevard, described elsewhere in this issue, was also briefly described by Mr. Niesz. This is a permanent exhibit of electrical appliances, particularly for household use, and is believed to be the finest establishment of its kind in the world.

The speaker also referred to the great value to the central-station industry of the annual Electrical Show held in Chicago every January. He also laid great stress on the importance of personal representation. He said that advertising creates the desire, but that a solicitor turns that desire into action and results follow.

To show the work done by the new-business or contract department of the Commonwealth Edison Company, Mr. Niesz mentioned the fact that the net new business of the company in 1908, exclusive of the large railway business carried by the company, was equal to 490,000 16-cp lamp equivalents. During the year 16,701 additional meters were attached to the company's mains.

Central-station publicity is designed to educate the public to use electricity-consuming devices. The endeavor should be both to stimulate and to create this use. New demands for electricity are created by introducing new devices or by new uses of old devices. As an instance of the new demand, the prominence of small vacuum cleaners, electrically operated, was mentioned as a characteristic of the work of last year.

Mr. Niesz closed by pointing out that of course this central-station publicity is a great help to the manufacturers and dealers in all kinds of electrical appliances. Many of the manufacturers follow a policy similar to that of the central-station companies. These efforts in turn help the electric-light companies by causing a greater demand for electricity to operate the devices which the manufacturers have put out. Co-operation between the manufacturers and the central-station companies is thus important. The policy of co-operation is sound in theory and excellent in practice, and too much stress cannot be laid upon it.

"The Edison Round Table."

The Commonwealth Edison branch in Chicago of the National Electric Light Association is about to issue the first number of a monthly publication bearing the name *The Edison Round Table*. This magazine is aimed to "run in series, but not in parallel" with publications of an engineering and educational nature which are available to all members of the branch. It will be handsomely printed and illustrated, with a cover. It will be a tie binding the various departments of the company in common interest and will set forth the personal side of central-station work. Brief descriptions will be given of what the "other fellow's doing," and the paper will be a means of recognizing individual work.

Features will be a "sermonette" (a cheerful talk on current topics) by "The Scribbler"; "The Oracle," otherwise the question box; a "postage-stamp gallery" of portraits in the department notes, all the pictures to be of the same size, to emphasize the democratic spirit of *The Round Table*, and a department headed "Auld Lang Syne," chronicling the doings of men formerly connected with the company. The paper is in charge of a publication committee. Mr. R. F. Schuchardt, of the engineering department, is editor; Mr. Dana H. Howard, of the advertising department, is business manager, and Mr. Harold Wright, of the contract department, is news editor. The "Oracle" is interpreted by Mr. Ernest A. Edkins, of the second vice-president's office. The aim of the little paper is to be clever, newsy and entertaining, and it is supposed that it will bring out much latent literary talent in the various departments of the company. No advertisements will be inserted.

The Chicago "Electric Shop."

Undoubtedly in its new "Electric Shop" the Commonwealth Edison Company, of Chicago, has opened the finest establishment in existence for the purpose of displaying and demonstrating the luxuries, conveniences and utilities of electricity in the home. The place is beautifully fitted up and, as mentioned in the brief description on Jan. 28 in these columns, is on the corner of Michigan Avenue and Jackson Boulevard. This is perhaps the best possible location for it in Chicago, in a region of smart hotels, restaurants, theaters and shops. Electric Shop is becoming one of the attractions of the city, and ladies have an opportunity to do their electrical shopping amid quiet and elegant surroundings, just as they select their jewels, or furs, or gowns, or furniture, in other shops. It is significant of a new order of things when one of the handsomest of the retail shops of the second city in the country is devoted to electrical merchandizing.

A large room on the corner, on the ground floor in the Railway Exchange Building, forms the main apartment of Electric Shop. This is divided by openwork screens into a reception-room and a salesroom, but architecturally is treated as one room. There is an entrance from each street, that from Jackson Boulevard being the principal one, opening into the reception-room which is the southern part of the large room, the arrangement being as shown in Fig. 1. Extending westward from the salesroom is a room fitted up as a dining-room. This has a separate entrance from the lobby of the building. Opening off the dining-room, to the south, are a kitchen and pantry. A lavatory completes the suite on this floor. In the basement, connection with which is effected by a private automatic electric elevator, are the laundry, small-motor room (household appliances), fixture-room and industrial-power room. Here also are the stockroom and the Railway Exchange substation of the Edison system, with five rotary converters having a total rating of 4500 kw. This substation is arranged for the inspection of visitors.

Electric Shop is another evidence of the enterprise and abounding faith of the Commonwealth Edison Company under the leadership of Mr. Samuel Insull. It is planned to be an advertisement of the central-station service of the highest class as well as a mercantile establishment which shall justify itself in a commercial sense. It is richly, even sumptuously, decorated and furnished, but the company is confident that the very large outlay involved will prove to be money well spent.

There are seven large show windows on the two streets, and in them are displayed examples of the wares to be found within. Above the second story of the building there is a continuous line of lights made up of 750 25-watt frosted-bulb tungsten lamps on the street fronts. This not only makes the building conspicuous, but brilliantly illuminates the sidewalks in front of the show windows. Electric Shop is open in the evening.

Tungsten lamps, with holophane reflectors, are used for window lighting. They are placed in the ceilings of the windows between screens of art-glass so as to be invisible to ordinary scrutiny. Rich hangings are provided for the windows; they were especially designed and have a lace border matching the style of the room. Each window bears the crest of Electric Shop. It may be mentioned here that one of the purposes of the establishment is to provide a rendezvous and restroom for ladies while downtown shopping. Comfortable chairs, writing desks and telephones are provided in one cozy corner of the reception-room for this purpose. Handsome stationery is at the disposal of guests, and it is illuminated with the Shop crest in colors. A lady is in charge of this, as of all other departments. Both men and women salespeople are in attendance.

FIG. 1.—RECEPTION AND SALES ROOMS, CHICAGO "ELECTRIC SHOP."

The interior decorations are Elizabethan in style, with wainscot and beamed ceiling. The woodwork is oak, in antique gray finish, and the wainscot is in the form of richly carved panels. These panels are hinged doors, and behind them are shelves for goods, or, in one case, the switchboard from which electric circuits are controlled. On the street sides of the Shop the corresponding panels are of leaded glass and form casement windows opening into the show windows. The floor is of interlocking rubber tile, dark green in color. Scattered over it are large Oriental rugs in deep, rich colors harmonizing with

the general tones of the rooms. The furniture is of carved oak, especially designed in the Elizabethan style, and in finish the same as the wainscot walls. The beams of the ceiling are richly decorated with gold and the strong primary colors. The ceiling between the beams is treated in a deep old gold.

Above the wainscot is a frieze of rich art-glass running entirely around the room and made up of 69 panels in designs representing old English coats of arms. Behind the glass are 60-watt tungsten lamps, the light from which is reflected back to a white-enameled wall and thence through the deep, warm colors of the glass frieze. By this indirect lighting uniform illumination of the frieze is secured, and when the lights are switched in there is a luminous band, softly but richly colored, running entirely around the room. The effect is very fine.

A conspicuous feature of the reception-room is a fireplace of white Bedford stone, carved in the same style as the wainscot. In it, supported by andirons especially designed, an electrical "wood fire" is apparently burning. This is a very clever illusion imported from Germany. The top fagots are of real wood and there is apparently half-consumed wood beneath. The whole is alive with the leaping light of a fire and the glow of the embers, which fitfully increase and diminish in the most natural manner. Electric light and thermostatic flashers are used to produce the effect, but are not themselves visible.

In the reception-room are a number of beautiful floor, table and portable lamps, highly artistic in design and very carefully executed. The shades are of colored glass, beautiful in form, color and tracery, which "light up" very effectively. These lamps, which form a conspicuous feature of the reception-room, are designed, both as to shades and standards, to represent various periods, as Egyptian, Greek, Pompeiian, Renaissance, Louis XV, Colonial, Viking and the like. Thus the lamp may be chosen to fit the style of the apartment which it is to adorn.

It is a feature of Electric Shop that all apparatus of whatever character may be shown in operation. Thus the display tables for lamps are wired with numerous convenient receptacles so that any lamp may be connected. In all there are about 100 baseboard outlets in the reception- and salesrooms, to say nothing of floor receptacles for tables and showcases, so that it is impossible to get very far from a connection for electric energy.

Ceiling and wall electric-light fixtures are provided in the reception- and salesrooms. They are especially designed and treated in gold and are notably handsome.

Shown on tables in the reception-room is a variety of high-class utensils for dainty electric cooking, as chafing-dishes, coffee percolators, tea-kettles, toasters and the like, in silver, copper, bronze or nickel, some with handles of ebony or other rather rare woods. The lamps and utensils shown in the reception-room are somewhat of a de luxe character. Less expensive types in profusion are to be found in the salesroom.

Before leaving the reception-room the electrical visitor should not fail to examine the switchboard, which is a particularly fine piece of workmanship, very attractive, but thoroughly practical. It is concealed behind the wainscot, as explained. When the wooden panel doors are opened, lamps placed above the switchboard are lighted automatically. The switchboard proper is

FIG. 2.—SALESROOM, CHICAGO "ELECTRIC SHOP."

4 ft. 9 in. wide and 7 ft. high. It is of Monson slate with receptacles and Edison plugs on each circuit and polished copper covers on the fuses. In front of the busbars and fuses are heavy beveled plate-glass doors, set in a metal frame. It is not necessary to open these doors except to replace a fuse. Sixty-eight circuits are controlled by double-pole push-button switches set in four vertical rows in a metal plate finished in lemon brass.

The switchboard panel is made up in two sections, each controlling 34 circuits. At the top of each section is a remote-control magnet switch. One of these switches controls all the show-window lights and the other the ceiling and bracket-fixture lights in the main room. These switches are operated by two extra push-button switches at the bottom of the board and also by push-button switches placed in a patrol box in an outside vestibule, so that the general lighting may be turned off at a late hour from the outside by the company's patrolman. The outside cornice lighting is also controlled by the patrolman from this patrol box. All the circuits in the main room (110-volt di-

FIG. 3.—CEILING FIXTURE IN DINING ROOM.

FIG. 4.—CEILING FIXTURE IN RECEPTION ROOM.

FIG. 5.—ENTRANCE TO AUTOMATIC ELECTRIC ELEVATOR.

FIG. 6.—SWITCHBOARD IN RECEPTION ROOM.

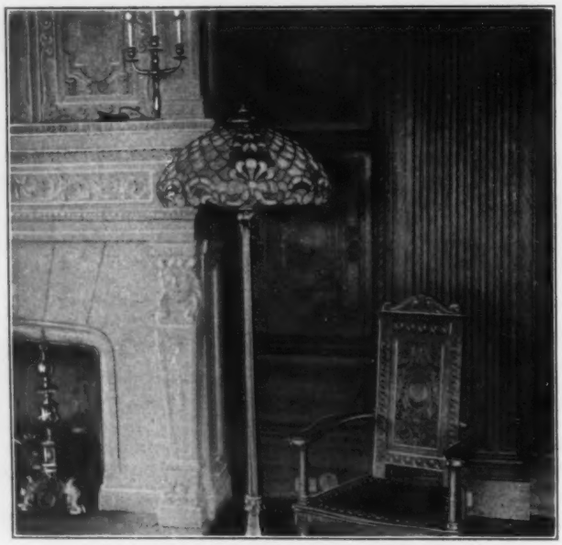


FIG. 7.—VIEW IN RECEPTION ROOM.

FIG. 8.—A CORNER IN SALESROOM.

THE CHICAGO "ELECTRIC SHOP."

FIG. 9.—ONE OF THE SHOW WINDOWS.

FIG. 10.—DINING ROOM.

FIG. 11.—FIREPLACE IN RECEPTION ROOM.

FIG. 12.—EXTERIOR VIEW OF "ELECTRIC SHOP."

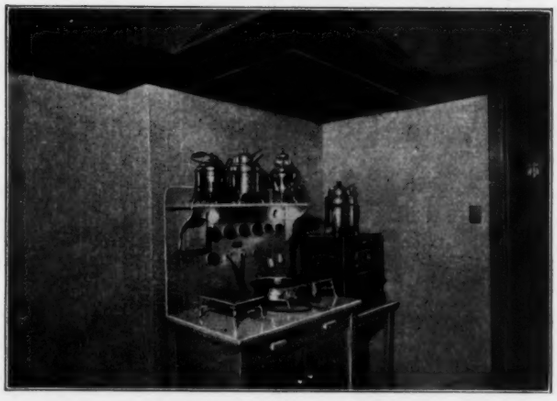


FIG. 13.—ELECTRIC KITCHEN.

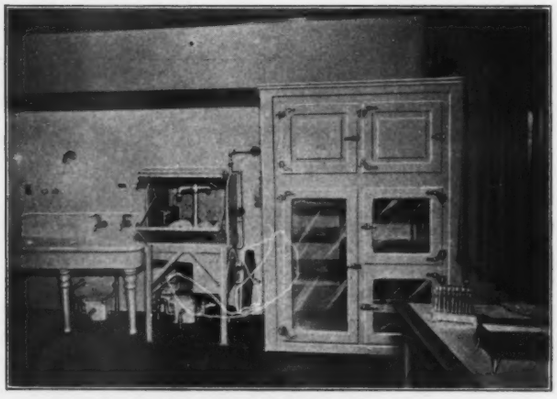


FIG. 14.—VIEW OF KITCHEN.

FIG. 15.—ELECTRIC WASHING MACHINES, ETC.

FIG. 16.—LAUNDRY IN BASEMENT.

THE CHICAGO "ELECTRIC SHOP."

rect current) are controlled from this switchboard. All others are fed from a large panel in the basement.

The salesroom, forming the northern part of the main room, has an outside entrance on Michigan Avenue, and connects with the dining-room and also with the basement by elevator. It contains the cashier's desk and also several showcases and counters displaying electrical goods, as well as a couple of cozy corners containing tables and chairs. A great variety of electrical specialties and novelties is here offered for sale. Among these are vibrators, fancy silk shades, flashers, various kinds of sockets, adapters for candlesticks, gas or oil lamps, electric heating pads, hair-driers, curling-irons, cigar-lighters, etc. Here also are to be found vacuum-cleaning outfits, luminous and non-luminous heaters, electric stoves and all kinds of electric heating and cooking utensils, as well as the less expensive portable electric lamps.

Designed in the style of the early English Renaissance, the dining-room is a smaller apartment, but dignified and rich. The wainscot is of fumed oak, terminating in a plate rail, above which is a highly colored frieze on a background of gold. Surmounting all is a vaulted ceiling ornamented in low-relief panels treated in gold and colors. The fireplace is of old English tile.

In it is an electric "wood fire" similar to the one in the reception-room. The handsome furniture in this room was especially designed for it and matches the woodwork in style and

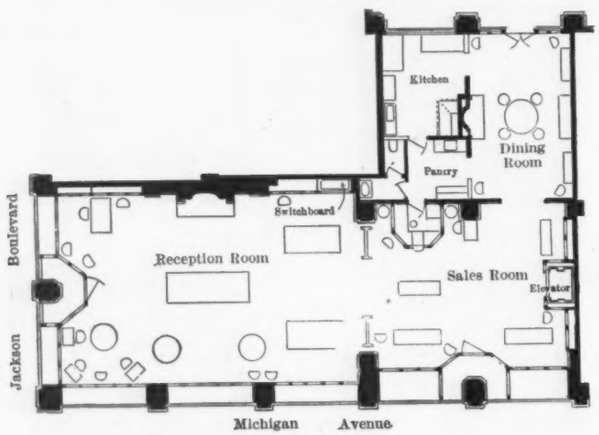


FIG. 17.—PLAN OF "ELECTRIC SHOP."

finish. The hangings are of silk brocade, after a design of the period which the room represents.

Perhaps the principal feature of this room is the lighting. There is a handsome central fixture over the dining-room table and also bracket fixtures extending from the walls. On each side of the central chandelier is an "Eye-Comfort" fixture depending from the ceiling by chains and reflecting the light of tungsten lamps to the ceiling, whence it is generally diffused through the room. There is still another system of indirect lighting from a trough or cove running around the room above the frieze from which the light is reflected from the cailing, which is of light color. Thus, in planning the illumination of one's home one can go to Electric Shop and see first one, then another of these systems tried, or a combination of two or more.

In the dining-room are a sideboard and two serving tables. The latter are connected ingeniously for electric cooking conveniences for breakfasts, luncheons or late suppers. A board, forming part of the top of the table, may be lifted up so that chafing-dishes or other utensils may be plugged in and then replaced, the cords going through holes for that purpose. A hot closet is to be another distinctive feature in connection with these serving tables.

The kitchen is designed to be a model one. The floor is of rubber tile and the woodwork is of maple varnished so that it may be cleaned easily. There are no sharp corners in which dirt may collect. The walls are of enameled white tile. All of the fittings are of the most up-to-date character, nickel-plated or white enameled. The porcelain sink is said to be the finest in Chicago. The electric cooking range is provided with a metal hood and has a complete electric cooking outfit. There are also an electric dish-washing machine with a glass front, a large refrigerator operated by a motor-driven ammonia plant in the basement and a kitchen table on which the operation of electric flatirons, toasters, waffle-irons or other devices may be demonstrated.

The sink in the pantry is of German silver. Here also is a china-closet and an "instantaneous" hot-water heater and a food-warmer, both electric, of course. The hangings at the doors in the kitchen and pantry are of a quaint design in white and yellow, recalling the work of the old English samplers.

The small elevator is of the automatic household type and the cage is handsomely finished, the shaft in the main floor being enclosed in a screen matching the general design. It is operated by a small three-phase, alternating-current motor and the mechanism in the basement is enclosed in glass partitions so that it may be inspected readily. The elevator is used only between the ground floor and the basement at present, but it is fitted with four control push-button switches, and it may be demonstrated as though operating in a building four stories high. No operator is needed, and the elevator will not operate if any door leading into the shaft is open.

Directly under the salesroom are the laundry and the room in which small motor applications for household use are exhibited. Here also is shown in operation a mercury-arc rectifier designed for the garage. This requires alternating current, of course, and there is also a small single-phase sewing-machine motor arranged to be controlled by pressure on the treadle of the machine. It may be stated here that all the bells, buzzers, door-openers, etc., in Electric Shop are operated by alternating current by the use of low-voltage transformers.

A marble wall panel is devoted to a demonstration of meters used on customers' premises, and also of the current-consuming capacity of various types of lamps. At the top of it is a bank of 24 lamps so arranged that all the lamps or any one of them can be cut into circuit with the meters below. The topmost of these meters is a direct-reading double-scale wattmeter, designed to show the actual current consumption of various lamps. Below this are two recording wattmeters with glass covers, one for alternating current and one for direct current. There is also an additional alternating-current integrating wattmeter of different manufacture. A Wright demand meter is also mounted on the board. A visitor is shown that when one lamp is in circuit the recording wattmeter can be seen in actual operation. With the addition of other lamps the speed of the revolving part, seen through the glass case, is proportionately increased, and thus it is shown, at least in an approximate way, that the motor accurately records the amount of electricity passing through it.

One ingenious household motor outfit is known as the "automatic kitchen." It consists of a circular table at the edge of which are mounted an egg-beater, a small churn, a fruit-juice extractor, an ice-cream freezer, a meat-chopper, a coffee-grinder and a potato-peeler. Surrounded by these little domestic conveniences is one central electric motor so arranged, with two speeds, that it may be connected to any one of the devices on the table by a flexible shaft. On other tables are shown knife-sharpeners, buffers for cleaning silver and other small household appliances capable of being driven by electricity.

There are a number of laundry appliances, as motor-driven washing-machines, ironing-table fixtures, plain electric flatirons and a large mangle which is not only turned, but heated by electricity, taking for the latter purpose from 38 amp to 40 amp. There is also an extractor to dry the wash by subjecting the wet clothes to the action of centrifugal force. This is arranged on a vertical shaft and the clothes are placed in an interior cylindrical receptacle provided with holes so that when the device is rotated at a high rate of speed the water will fly off into the outside containing tank, thus drying the clothes without the necessity of hanging them out. An electric water-

heater is applied to a large tank in the laundry and affords an example of the production of hot water by electric heat on a considerably larger scale than is usually the case.

The ammonia plant for operating the kitchen refrigerator is also in the basement. This is arranged so that ice may be procured from it for table use.

In the basement also is the vacuum-cleaning plant. This consists of the usual motor and air-pump, mounted on one base. Three cleaning outlets are provided in the baseboards of the upper rooms. These are flush with the wood and are not easily seen. By raising a metal flap a hose coupling may be inserted. Beside the hose outlet is a flush, key, quick-break switch by which, through an automatic starting-box, the motor of the vacuum cleaner in the basement may be started. This switch can be operated only by the key which goes with it. Thus it cannot be tampered with by unauthorized persons. The motor is stopped by inserting the key in another hole in the switch.

Different grades of fixtures are displayed in the fixture-room in the basement. A demonstration is also made here of the color effect of various illuminants. Another feature of this room is intended to represent an installation of special emergency lighting in the household. This emergency or burglar circuit is arranged to be controlled from a master switch in the bedroom of the head of the house. In case of necessity all the lights on this circuit can be turned on instantly to the discomfiture of the marauder. The special feature of this is that the same lights can also be used in the ordinary illumination of the rooms, which is, of course, a valuable feature.

A third room in the basement is known as the "Industrial Power Room" and contains a wide variety of motor-driven machinery, such as a lathe, a floor-surfacing machine, a blower, a grinder and buffer, a floor polisher, beer pump, deep-well and house pumps, drills, punches, dough-mixer, potato-peeler, factory sewing-machine and a number of others. Wherever practicable the machines are driven by individual motors. Here also are examples of the application of electric heat to industrial requirements, as soldering-irons, glue-pots and the like. Advantage is also taken of the opportunity afforded by this room to show motors of various types.

A stockroom is given space in the basement. Here there are bins and shelves for the electrical wares displayed so attractively on the floors above, and it is sometimes hard for the stockkeeper to meet the demand. There is an intercommunicating house telephone system of six stations, with wiring for additional stations. Electric Shop is also equipped with six city telephones.

In all there are over 200 distinct electrical circuits in Electric Shop. A separate main is led from the substation in the building and the service switches are in the basement. Allusion has been made already to the two switchboards from which the circuits are controlled. Rubber-covered wire is used throughout and all wiring is in iron pipe and, of course, executed in the most approved manner.

A specially designed electric automobile delivery wagon of handsome appearance will be used to deliver to customers goods purchased in Electric Shop.

A great deal of work has been expended on the general plan and numerous details of Electric Shop by the executive and engineering staffs of the Commonwealth Edison Company, and the architectural design was placed with D. H. Burnham & Company, Chicago. It was decided over a year ago that the work should be carried out, but actual execution was delayed, and, after four months of busy preparation, the Shop was opened on Jan. 10. Since then the wisdom of upholding the dignity and value of electric service in such an elaborate manner has been vindicated in steadily increasing degree.

To show the pains taken by the Commonwealth Edison Company to embrace in Electric Shop a wide variety of electrical apparatus used in or about the home, the following list of the names of makers of goods on exhibition (embracing also some devices used in construction) is given. An effort has been made to make the list complete, but it is so extensive that there may be some unintentional omissions:

Elevator.—Otis Elevator Company, New York.

Mercury-Arc Rectifier.—General Electric Company, Schenectady, N. Y.

Transformers (low-voltage).—Thordarson Electric Manufacturing Company, Chicago.

Incandescent Lamps.—General Electric Company, Schenectady.

Switchboards.—H. Krantz Manufacturing Company, Brooklyn, N. Y.

Meters.—General Electric Company, Schenectady; Fort Wayne Electric Works, Fort Wayne, Ind.; Wagner Electric Manufacturing Company, St. Louis.

Lamps—(floor, table and portable).—Duffner & Kimberly Company, New York; Pairpoint Manufacturing Company, New Bedford, Mass.; Handel Company, Meriden, Conn.; Colonial Art Glass Company, Chicago; H. G. McFaddin & Company (importers), New York; Bradley-Hubbard Manufacturing Company, Meriden, Conn.

Fixtures, Reflectors and Shades.—Willy H. Lau, Chicago; National X-Ray Reflector Company, Chicago; Federal Electric Company, Chicago; Phoenix Glass Company, New York; Quezal Art Glass & Decoration Company, Brooklyn; H. W. Johns-Manville Company, New York; Will & Baumer Company, New York; Macbeth-Evans Glass Company, Pittsburgh; Dale Company, New York; Plume & Atwood Manufacturing Company, New York; A. J. O'Leary, Chicago; Holophane Company, New York; Faries Manufacturing Company, Decatur, Ill.; Overbagh & Ayres Manufacturing Company, Chicago.

Switches, Sockets, Receptacles, Wiring Specialties.—Hart & Hegeman Manufacturing Company, Hartford, Conn.; Federal Electric Company, Chicago; Cutler-Hammer Manufacturing Company, Milwaukee; Arrow Electric Company, Hartford, Conn.; Pass & Seymour, Solvay, N. Y.; Harvey Hubbell, Inc., Bridgeport, Conn.

Heating and Cooking Utensils.—General Electric Company, Schenectady; Simplex Electric Heating Company, Cambridge, Mass.; American Electric Heater Company, Detroit; Inventors & Manufacturers' Sales Company, San Francisco; S. Sternau & Company, Brooklyn (designs).

Flatirons.—General Electric Company, Schenectady; Simplex Electric Heating Company, Cambridge, Mass.; Westinghouse Electric & Manufacturing Company, Pittsburgh; Pacific Electric Heating Company, Ontario, Cal.; Pelouze Electric Heater Company, Chicago.

Heated Tools.—General Electric Company, Schenectady; Simplex Electric Heating Company, Cambridge, Mass.; Vulcan Electric Heating Company, Chicago; Del Sales Company, Chicago.

Cleaning Apparatus (electro-pneumatic).—Atwood Vacuum Cleaner Company, Madison, Wis.; Duntley Manufacturing Company, Chicago; Electric Suction Sweeper Company, New Berlin, Ohio.

Refrigerator.—Wolf, Sayer & Heller, Chicago (using apparatus of Brunswick Refrigerating Company, New Brunswick, N. J.).

"Automatic Kitchen."—A. A. Automatic Manufacturing Company, New York (successor to Aderer Brothers).

Laundry Appliances.—American Laundry Machinery Manufacturing Company, Chicago; Hurley Machine Company, Chicago; A. W. Kratz, Chicago.

Vibrators.—Swedish Electric Vibrator Company, Chicago; Standard Electric Works, Racine, Wis.; Monarch Vibrator Company, Chicago; Shelton Electric Company, Chicago.

Dish-Washing Machine.—Garis-Cochrane Manufacturing Company, Chicago.

Sewing-Machine Motor.—General Electric Company, Schenectady.

Intercommunicating Telephone System.—Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

Miscellaneous.—H. W. Johns-Manville Company, New York (linolite); Benjamin Electric Manufacturing Company, Chicago (adapters); American Electric Novelty & Manufacturing Company, Chicago (flashlights); J. F. Sturdy, Chicago (general decoration); William A. Pope, Chicago (heating and ventilation); New York Belting & Packing Company (rubber floor).

INTERIOR WIRING AND ILLUMINATION

Standardizing Lamps and Reflectors.

Not many years ago little attention was paid to the scientific use of reflectors and other accessories for changing the distribution of light from incandescent lamps so as to get a larger amount of useful illumination on the working plane. During the past five years an increasing amount of thought has been given to this matter. It is only recently, however, that some of the principal lamp and reflector manufacturers came to a full realization of the importance of having the lamp filament and reflector in proper relation to each other if the desired results as to light distribution are to be obtained.

When the deep-bowl types of reflectors, which are now so commonly used with tungsten lamps, were first brought out, the characteristic distribution curves published with them indicated that uniform illumination might be expected over a considerable area under such a lamp and reflector. The maximum candlepower was indicated at an angle of 30 deg. to 35 deg. from the vertical. After such reflectors had been on the market some time, numerous users began to observe that in many cases much more light was concentrated immediately under the lamp and reflector than would be expected if the distribution was that indicated by the curves. Investigation of this point demonstrated that reflectors of this deep-bowl type would become concentrating rather than distributing reflectors if the lamp filaments were placed deeper in the reflectors than were the filaments on the lamps upon which the original tests were made. At that time there was no standard position for lamp filaments fixed by various lamp manufacturers, and it became evident that in order to produce definite light distributing results with reflectors, uniformity in position of lamp filaments with respect to the lamp bases as well as uniformity of holders and reflectors would be necessary. As a result, a standardization committee was suggested, this committee to consist of engineering representatives of various important lamp factories and one of the large manufacturers of reflectors.

As a result of this movement the lamp factories have fixed upon definite dimensions of lamps and filaments, so that the reflector manufacturers can design reflectors with the knowledge that if used with the sizes of lamps and types of shade holders for which they are designed, the desired light distribution will not be changed by the lamp filament not being in the expected place in the reflector. There is approximately 1 in. difference in the position given a reflector by a standard 2¼-in. holder, as compared with the holder commonly known to the trade as "Form H," which holds the reflector lower. If manufacturers' instructions are properly followed, there is no excuse for the use of the wrong holder. If users generally realized what difference in appearances and practical effect may be caused by the use of the wrong holder, more attention would be given to this point. At the present time even fixture houses need a word of caution as to this, to say nothing of other users who are not supposed to be so well posted.

Engineering and Illumination.

By H. Thurston Owens.

So much has been written concerning illuminating engineering which is obviously not "engineering" in the sense in which gas and electrical engineers understand and use the term, that many doubts have been expressed as to the necessity for a distinct branch of applied science to care for this feature of the gas and electric industry.

Two years ago a society was formed in this country, known as the Illuminating Engineering Society, whose object, as stated in its constitution, is "the advancement and dissemination of theoretical and practical knowledge of the science and art of illumination."

The requirements for membership are that "any person interested in the objects of the society shall be eligible to membership." This is surely not a rigid and exacting requirement, for among those directly interested can be included the physicist, photometrist, chemist, oculist, the gas engineer and electrical engineer, the manufacturer of lighting appliances, the decorator, the architect, the plumber and the public at large. Nevertheless, the results from the formation of the society have been farreaching and credit for at least some of the improvement in lighting conditions should be given to this most successful of our youthful technical bodies.

To what extent "engineering" has been responsible for the "uplift" it would be hard to determine, but one feature of the campaign shows evidence of considerable engineering skill and application, namely, the bulletins and catalogs issued by manufacturers of lighting appliances. Should the engineer care to apply the laws of light when planning an installation, data are now available to aid him in obtaining the best results. Whether the results hoped for are effective, efficacious, economical or efficient, depends altogether upon the individual, but they should always be hygienic.

Sanitary engineers are employed to provide necessities which shall not violate the laws of hygiene, and lighting engineers have failed in the past to install lighting systems where one can work without danger of severe eyestrain. Undoubtedly artificial light can be provided in such a manner that our eyes will not suffer to any greater extent than when used under natural light, and in some cases the advantage will be on the side of the former.

When all of the varied interests meet upon common ground in a technical society, the interchange of ideas will, without question, have a wholesome influence toward better things, which means better engineering and not better salesmen of accessories; these are only the buds and blooms, the fruit will follow as the art ripens.

If interiors and streets can be illuminated in such a manner as to reduce materially the number and intensity of the evils found in our installations of to-day without illuminating engineering, all well and good; but the very installations themselves stand as "horrible" examples of "common-sense" practice and the rule-of-thumb methods of the past.

Electric Illumination of Niagara Falls Park.

A most important transformation on the State reservation at Niagara Falls has been effected by the introduction of incandescent lamps for illumination. Formerly unsightly arc lamps afforded the only outside illumination about the beautiful park. The wires running hither and thither were quite out of place in this beauty spot, where efforts were being made to return to primeval conditions. The poles marred the park scene, having no relation to the natural forest conditions, and as the distribution of light was lacking in uniformity, the results were far from satisfactory.

In 1901 the Legislature of the State made an appropriation of $7,000 to meet the expense of installing an electric lighting system in the State reservation grounds and buildings. Three electrolysis-proof conduits, having a diameter of 3 in. on the inside, were laid from the uppermost point of the reservation, known as Port Day, to the Administration Building in Prospect Park. The necessary manholes of brick with iron covers were provided, the conduits being laid in heavy concrete. In two of these conduits the Niagara Falls Power Company, at its own expense, installed cables of sufficient capacity to supply current for light and power purposes in the park, the buildings and the old inclined railway structure, agreeing to execute a bill of sale to the State at the nominal sum of $1 when the lighting system was installed. This generosity on the part of the Niagara Falls Power Company was a great help to the reservation commissioners and proved of material assistance in making it pos-

sible to give visitors to the Falls an illumination that has made pleasant the evening visits of tourists and excursionists from all parts of the world to scenic Niagara.

In 1907 the Legislature appropriated an additional $14,000 for completing the electrical installation for lighting the grounds. The necessary lateral conduits were laid to 96 poles, while transformer stations were established at three different points. One of these is at Port Day (Fig. 1), another in the bluff along the upper river above First Street (Fig. 2), while

FIG. 1.—TRANSFORMER STATION AT PORT DAY.

the third is in the basement of the Administration Building. Each transformer station has the necessary switchboard and reduces the current from 2200 volts, the voltage at which it is received from the Niagara Falls Power Company, to 120 volts. The station at Port Day controls three branch lines, that in the bluff five lines, and that in the Administration Building seven. There are three transformers in the basement of the Administration Building, only one of which is connected with the outside lighting service, the others supplying the lighting and the electrical heating circuits of the building. This station, of course, carries the heaviest load of the three. There is also a transformer located in the old inclined railway building, which supplied the electric power service of the incline until July 6,

FIG. 2.—TRANSFORMER STATION CONCEALED IN BLUFF.

1907, when the commissioners ceased to operate this railway convenience, which lowered passengers from the top to the base of the cliff to take the steamer *Maid of the Mist* and view the falls from below. The railway was a double-track affair, the length having been 330 ft. The cars were lowered and raised by manila and wire cables.

Considerable difficulty was experienced in selecting the proper pole for installation throughout the reservation to carry the lamps. Superintendent Edward H. Perry was determined that these necessary poles should not be of a design that would mar the landscape, the result being the pole shown in Fig. 3 which so nicely fits the scene without intruding. These poles are 14 ft. high and of iron. Each pole carries six 32-cp incandescent lamps under an aluminum reflector protected by a galvanized-iron hood. In the illumination of the reservation the desire was to keep as much light as possible down under the foliage of the trees in summer time, when the park is most patronized. For this the aluminum reflector was deemed most desirable, for had a glass reflector been adopted there would have been expensive repair bills through the acts of children, and even of grown persons. In the case of the aluminum reflectors, it has been found a comparatively easy matter to smooth out the dents made by stone-throwing and similar causes. Every pole has its individual switch within itself, and each branch or lateral line is controlled from a different station.

Since the lighting system was installed it has afforded a very interesting study in several respects, and particularly so in regard to the lamps installed in Prospect Park along the river, where the spray cloud is swept back upon them in winter time. All familiar with Niagara conditions will recall the heavy ice they have seen pictured, or in reality, on the trees of this section of the park. The lamps came in for very similar treatment at the hands of the spray cloud and Jack Frost, but at times

FIG. 3.—LAMP POST ON N. Y. STATE RESERVATION.

when the wind is sweeping the spray of the American Fall back on the lamps the lights keep burning and it has been found that they generate sufficient heat to keep them free of ice.

All who have passed up or down the old inclined railway at Niagara will recall that at one point the gloom was rather heavy, and particularly so along the free stairway. With the installation of the new lighting system, Superintendent Perry was quick to avail himself of the ever-ready service of the current and he had a row of lights installed at the darkest spot on the stairway, greatly increasing the pleasure of those climbing up or down the long flight of stairs, while the foot travel was rendered much safer.

A still greater benefit accrued from the lighting system through driving darkness away from points along the upper river between Goat Island bridge and Port Day. This is one of the most beautiful localities on the State property at Niagara, but it was for years so marked by disorder and hoodlumism that it was found necessary to close this section at nightfall, nobody being permitted to pass certain points after dark. However, with the brightness given to the locality by the new lights, a great change was wrought and now this is one of the best patronized pleasure spots of the reserve, as it is possible for the reservation officers to see long distances along the road-

ways, under the trees and all about, the lights thus beyond question proving a splendid factor in the maintenance of order and morals.

The Administration Building is electrically heated, and in coldest weather the building is quite comfortable in all the rooms of the interior. This is the only building on the State reserve wholly heated by electricity.

The contract has been awarded and the work of installing a new double electric elevator to supplant the old inclined railway is now in progress. This elevator is destined to create many changes both in Prospect Park and on the slope below the high bank. New views will be opened above and below, and visitors to the Falls will doubtless praise the improvement, which is to cost nearly $100,000. The old stone inclined-railway building near Prospect Park will be razed. In front of its site, just inside the face of the cliff, the new electric elevator, carrying 15 people, is to be placed. The shaft is now being sunk to a depth of about 140 ft. From the bottom of this shaft a tunnel 140 ft. long and 10 ft. 4 in. x 10 in. in dimensions will extend to the face of the cliff. At the foot of the elevator there will be a waiting-room enlargement, and the outer end of the tunnel will open into an observation pavilion. This latter structure will be of rough stone quite in harmony with the cliff appearance. Three sides of glass will permit ample observation facilities from the inside, while the building will have a concourse 5 ft. wide running about its sides and front. To the left one may look upon the tumbling torrent of the American Fall as this body of water pours from the higher to the lower level, the scene being one of the most inspiring and fascinating at Niagara, while to the right the giant span of the upper steel-arch bridge, the tremendous flow and force of the tunnel stream will be observed and a fading view obtained of the distant gorge. The rare music of the plunging flood will here be greatly enjoyed by visitors, but perhaps more so as they leave the observatory and walk down the new paths to be built at gentle grade to the water's edge. These paths will be of zigzag form, about 5 ft. wide, each stretch of 115 ft. carrying one down 30 ft. to the roar of the fall. The excavated material will be used to develop new and higher levels on the rocks near the dock of the *Maid of the Mist*, while in the park above the elevator station will be wholly underground. This will open new views of the American Fall from vantage points in the park, while improving the park grades thereabouts. It is hoped that this year the telephone wires running about Goat Island will be placed underground, and when this has been accomplished there will be no wires in sight on the State property at Niagara.

Letters to the Editors.

Valuation of Public Utility Properties.

To the Editors of Electrical World:

Sirs:—I read with interest Mr. W. H. Winslow's letter in your issue of Feb. 25 on "Valuation of Public Utility Properties." It seems to me, however, that he has failed to meet the situation squarely.

He assumes that the producing value of equipment remains constant to the end of service. It may also be stated that the cost of replacing equipment should be equally distributed over the time during which the equipment is in service. This means a reserve accumulation during the first few years of service. If such a reserve is not provided, and other things are equal, the net earnings will be greater when the property is new than later on when some of the apparatus is being replaced. Without a depreciation reserve such expenses become a greater and greater charge to the income account. With a depreciation reserve these expenditures are charged to this account, which acts as a sponge to take up the irregularities of such expenses.

A better conception of depreciation, especially in a public service corporation, where the existence is perpetual, would seem to be that of the property wearing out in different parts at different times so that eventually the annual cost of replacing certain parts is about equal to the total depreciation of the whole property for the same year. It is thus evident that net earnings should be higher at first. Therefore, if the earnings, whether high or low, are all paid out in dividends it amounts to the payment of dividends from capital. This is made evident by glancing at the simplest of balance sheets:

ASSETS.	
Plant investment	$600,000
LIABILITIES.	
Capital stock	600,000

Now if the property is sold for $300,000 the stockholders will receive only 50 cents on the dollar (and water).

Let us consider the purchaser's side of the case, as Mr. Winslow has done. The first suggestion was to set aside as reserve a sum equal to the difference between the purchase price and the cost of reproduction, new. This would make the balance sheet:

ASSETS.	
Plant investment	$300,000
Cash	300,000
LIABILITIES.	
Capital stock for investment	300,000
Capital stock for reserve	300,000

(Capital stock is subdivided to show the case clearly. It should be under one head as $600,000.) In this case the cash balance can be invested and the plant investment will not be burdened with earning dividends on the entire capital stock. It is evident that if the books of the selling company had shown the conditions accurately, they would have had this cash or an equivalent asset. As the Supreme Court states, it is immaterial as far as the result is concerned whether this asset was spent in dividends or lost in too low charges.

Another method was to pay the purchase price, but to charge enough for electricity to give the necessary depreciation reserve when the time came for replacement. In other words, the partly depreciated plant is bought, pays dividends on actual investment, but in a few years out of its earnings builds a brand-new plant—an excellent scheme for concealing earnings! It would be interesting to know what this would yield the investor when the new plant had been built and the expense of double depreciation removed.

In conclusion I wish to state that I agree with Mr. Winslow that the same rates are necessary for the same dividends at all times. But if, when the plant is new, there are not enough earnings above the dividends to provide for depreciation, there is most certainly going to be trouble later on. If they do earn enough and yet spend it in dividends, they have only themselves to blame when, later on, the courts tell them that their property has depreciated and that their stock is partly water.

West Lynn, Mass. F. E. Haskell.

Spiez-Frutigen Single-Phase Railway.

To the Editors of Electrical World:

Sirs:—In the article in the issue of Feb. 4 entitled "Single-Phase Equipment for the Spiez-Frutigen Railway" we note the statement that the motor-cars, locomotives and the overhead equipment will be supplied by the Oerlikon and Siemens-Schuckert companies. We beg to call attention to the fact that we also are supplying one single-phase locomotive, equipped with two motors of 800 hp each (1600 hp total), for this line. We should be glad if you would mention this in your columns.

Allgemeine Elektricitäts-Gesellschaft.

Berlin, Germany.

The Rapid Calculation of Power Consumption in Illumination.

To the Editors of Electrical World:

Sirs:—The writer was much interested in an article entitled "The Rapid Calculation of Illumination," by Messrs. Cravath and Lansingh, on page 89 of your issue for July 11, 1908. The method which is outlined permits the calculation of the

desired mean illumination and an experimental constant representing the consumption for the particular lamps used, or the number of lamps, from the area of the illuminated surface. It gives the writer great pleasure to learn that the method described in his book "Grundzüge der Beleuchtungstechnik" (Elements of Illuminating Engineering), page 78, and in Uppenborn's "Kalender für Elektrotechniker, 1908," Part I, page 316, has been received with favor in America, since it is, indeed, the simplest and most convenient method of calculating illumination. Another reason why it is desirable to have the use of this method become widespread is that the constant watts per square foot per foot-candle—watts per lumen—which is very useful in judging the comparative merits of various illuminating methods, will become more familiar to the illuminating engineer.

In an earlier article* I called attention to the specific meaning of this quantity. In the comparison of different kinds of illumination this quantity is of great importance both for street and interior illumination, just as the specific consumption—watts per candle—is useful in comparing different kinds of lamps. As far as I know, this quantity has received little attention in America, its reciprocal—foot-candles per watt per square foot—although less convenient in calculation and practice, being most often used.

In changing the value of economy from German units—watts per lux per one square meter—into American units—watts per square foot per one foot-candle—the ratio of the units of length cancels, and the two values are inversely proportional to the ratio of the light units, and we have: One watt per lux per square meter = 1.10 watts per square foot per one foot-candle, using the new light unit as a conversion factor fixed by the International Photometric Commission.

Values of the watts per lumen for the principal practical methods of illumination are given in the above-mentioned book in a table on page 133. In order to facilitate the use of this simple method, the values of this table have been converted into American units, and are given herewith. The values are based upon the mean horizontal illumination from a distance of 1 m above the floor in interior illumination, and 1.5 m in street illumination.

The table gives only maximum and minimum values; the exact values to be chosen for given conditions depend upon the specific consumption of the lamps to be used, their arrangement, and, especially, upon the height of suspension above the surface to be illuminated. In interior lighting for small and poorly illuminated rooms, higher values, and in large and well-illuminated rooms, lower values are chosen, always taking values inside the limits given in the table. When too little is known of the governing conditions to permit an intelligent choice, a mean value must be given.

For illuminants not given in the table, the watts per lumen can be ascertained by comparison with the specific consumption—watts per candle—of the source in question, with the usual sources of similar intensity and distribution. The values given by Messrs. Cravath and Lansingh in your issue for July 11, 1908, agree well with those in the following table.

In order to amplify as much as possible the experimental data given herewith, on the consumption with different methods of lighting, it is desirable when photometric measurements are being made, that the consumption in watts per square foot per foot-candle should always be determined. For this purpose it is essential that the measurements be so made that the horizontal illumination of the interior or street area can be determined, which offers no particular difficulty when suitable methods are employed.

PRACTICAL VALUES OF CONSUMPTION WITH MOST USUAL LIGHTING METHODS.

Sources.	Consumption per Square Foot per Foot-Candle. Street Illumination. Watts.	Interior Illumination. Watts.
Carbon-filament lamps	0.9 — 1.3	0.55 — 1.3
Nernst and tantalum lamps	0.4 — 0.65	0.25 — 0.65
Metallic-filament lamps	0.28 — 0.45	0.17 — 0.45
Ordinary direct-current arc lamps	0.17 — 0.28	0.17 — 0.33
Direct-current flaming-arc lamps	0.055 — 0.13	.....
	Cu. Ft. per Hour.	Cu. Ft. per Hour.
Vertical incandescent gas lamps	0.016 — 0.024	0.012 — 0.024
Vertical incandescent pressure gas lamps	0.012 — 0.024	0.008 — 0.016
Inverted incandescent gas lamps	0.010 — 0.018	0.008 — 0.016

BERLIN, GERMANY. L. BLOCH.

Elektrotechnische Zeitschrift, 1906, page 493.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Abstracts of the important articles appearing in the electrical periodical press of the world

Generators, Motors and Transformers.

Induction Motors for Rapidly Fluctuating Load.—A description of the "spinner" induction motors which are designed to meet the requirements of textile mills, rolling mills, mining work, etc., that is to say, for use where frequent stopping and starting under load are necessary, or where rapid and violent fluctuations of load are experienced, and for work requiring various speeds. In its simplest form the "spinner" motor is a squirrel-cage induction motor, designed so that the customary stator may be allowed to revolve, a band-brake serving to control its movement. The method of operation is as follows: The rotor is connected to the load and the brake is released, thereby leaving the stator free to rotate. Electricity is then supplied to the stator windings through brushes and slip-rings, the stator beginning to rotate in a direction opposite to the normal direction of rotation of the rotor. When the stator has attained synchronous speed the brake is applied to it, and the rotor then begins to move, gradually coming up to normal speed, which latter is attained when the stator has been brought to rest. A special type of "spinner" motor is shown in Fig. 1. It consists of three concentrically arranged elements: the rotor *A*, spinner *B* and stator *C*. The stator is fixed, while the other two elements are capable of rotation. The rotor carries a squirrel-cage winding, and the spinner a former winding (which is connected to the slip-rings *D*) on its inner periphery and a squirrel-cage winding on its external surface. The stator carries a former winding, to which power is supplied in the usual manner. On the spinner *B* is also a band-brake *E*, which can be operated either by hand or magnetically, as desired. Power is taken off the rotor shaft *F*, as in the case of an ordinary motor. For middle speed the spinner is held stationary by the brake, and current is applied to its inner windings; the rotor, with load connected, then runs at normal speed, the conditions being those of an ordinary induction motor. For the higher speed the spinner brake is released and current is simultaneously

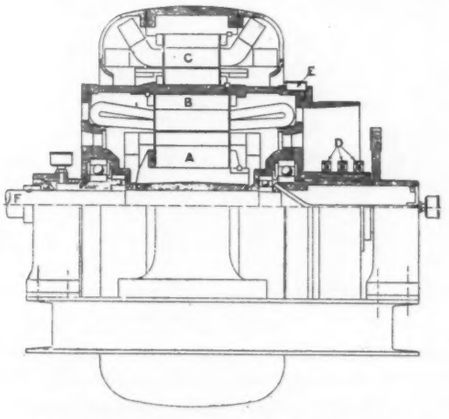


FIG. 1.—DIAGRAM OF "SPINNER" MOTOR.

applied to the windings of the outer member or stator, so as to rotate the spinner in the same direction as the rotor. The lower speed is obtained by applying current in the reverse direction to the stator, so as to rotate the spinner in a direction opposite to that of the rotor.—Lond. *Electrician*, Feb. 26.

Heating of Windings.—E. Arnold.—A mathematical paper on the heating of windings in dynamos with great iron length. In such machines the temperature of the copper along the winding of a coil is very variable and may reach a prohibitive value in the center of the machine, although the mean value of the increase in temperature is still permissible. The author shows how to calculate the temperature for any point of the winding and also the maximum temperature of the copper. He also determines the influence of the different factors, such as temperature of the iron, current density, insulation, etc.—*Elek. Zeit.*, Feb. 25.

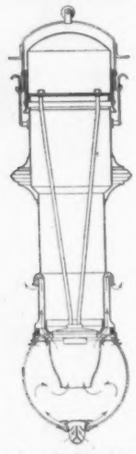
Testing of Direct-Current Machines.—W. Lulofs.—A paper read before the Birmingham section of the (British) Inst. Elec. Eng. The author described a method of carrying out the Kapp-Hopkinson circulation of power test on a single lap-wound continuous-current machine. The author gave two alternative arrangements, both of which, however, necessitated the employment of an auxiliary machine. Some effects of armature reaction in lap-wound machines, and their application to the design of a constant-current generator, were also dealt with in the paper. In the discussion which followed the reading, it was suggested that the equalizing connections are unnecessary in lap-wound machines. The effect of the magnetic pull produced by the unequal excitation of the poles for the purpose of the author's test was also discussed.—Lond. *Elec. Eng'ing*, Feb. 25.

Calculation of Transformers.—J. T. Duyvis.—A mathematical paper on the design of transformers in such a way that the cost of the active material—copper and iron—becomes a minimum.—*Elek. und Masch.* (Vienna), Feb. 7.

Turbo-Generators.—Dollinger.—The first part of an article on the calculation of mechanical parts of high-speed machinery, with special reference to turbo-generators.—*Elek. Anz.*, Feb. 21.

Lamps and Lighting.

Flame-Arc Lamps.—An illustrated description of a new form of flame-arc lamp. The lamp, shown in Fig. 2, is provided with two pairs of electrodes, for burning in succession. As each pair has a burning life of somewhat over 17 hours, the total number of hours that the lamp will work with one trimming is about 35. The feeding mechanism is very simple, in spite of the necessity for a change-over device which comes into operation when the first pair of electrodes is nearly burned out, and a low initial cost is one of the advantages claimed. In order to prevent the deposit of ash on the globe, the lamp is fitted with an inner chimney or globe which induces a strong upward draft. Not only does this carry the fumes rapidly away, but as the globe is so close to the arc, it gets hot quickly and tends to prevent the formation of a deposit. The body of air between the globes prevents the cooling of the inner one. Another new feature is the ash tray, below which are several vertical, radial vanes, arranged to assist the upward draft of air and to act as an air-trap. The products of combustion are carried through the inner globe and between the cover and inner sleeve of the lamp. A certain amount of ash is deposited on these metal surfaces, but this can easily be wiped off when trimming the lamp. In order to obtain a better distribution of light the inner globe is provided with a number of prismatic ribs. Fig. 3 shows the change-over mechanism. The weighted electrodes are supported by chains wound in opposite directions on drums, there being a drum for each pair of electrodes. Each drum is geared through a train of wheels to an escapement wheel. These wheels are shown at *A* and *B*. In the position shown the pair of electrodes to which the wheel *A* belongs is burning, and the anchor of the escapement, which is pivoted at *C*, is free to work when the detent *N* rises. The anchor of the other wheel *B*, which is pivoted at *D*, cannot move, however, because although the detent *O* rises with the detent *N*, the bar *G* engages with the upper portion of the anchor and holds it. The bar *P* is controlled by the shunt and series solenoids in the usual manner, and when the shunt solenoid rocks it up, the escapement-wheel *A* is released and feeding takes place. When the first pair of electrodes is nearly burned out, a catch on one of the chains lifts the rod *L* and tilts the bar *G* into the position shown dotted. The anchor of the escapement-wheel *B* is thus released and feeding of the second pair of electrodes will take place directly the arc on the first pair lengthens out. When the second two touch, the arc is transferred from the first pair to the new electrodes. The arc is thus never extinguished, and the light given out by the lamp is practically unaffected during the change-over from the first to the second pair of electrodes. After the second pair has been consumed another catch rises and pushes the rod *M* up again, so that the first feeding mechanism is ready to operate as soon as the lamp has been supplied with fresh electrodes. Attached to the bar *P* there is a rod which strikes and regulates the arc in the usual manner.—Lond. *Elec. Eng'ing*, Feb. 25.



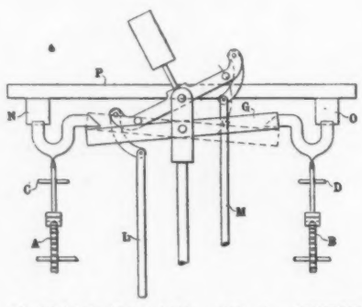


FIG. 2.—CROSS-SECTION OF FLAME-ARC LAMP. FIG. 3.—SKETCH OF CHANGE-OVER MECHANISM.

Effect of Alternating Current on Tantalum Lamps.—O. Scarpa.—An investigation of the reasons why tantalum lamps have a much longer life when used with direct current than with alternating current. The author has observed that the surface of the metallic filaments operating for a long time with direct current gets rough, thereby indicating a change from an amorphous to a crystalline structure. This change may be due either to high temperature or to mechanical oscillations. In the case of the tantalum lamp the mechanical oscillations due to the electrodynamical reactions between the parallel pieces of the filament is of chief importance. The filament appears to vibrate with double the frequency of the current. The author could observe with a microscope the vibrations of filament under alternating current. With vertical "osmin" (tungsten) lamps the oscillations are much smaller, probably on account of the greater weight and the pasty condition of the filament and the greater symmetry of the lamp. This fact probably explains why tungsten lamps are not so deleteriously affected by alternating current—*Elettricista*, 1908, No. 19; *Elek. Anz.*, Feb. 7.

Mean Hemispherical and Spherical Candle-Power.—E. W. Weinbeer.—The first part of an article illustrated by diagrams in which the author gives a critical summary of the following methods for determining the mean hemispherical and spherical candle-power: (1) by calculation; (2) Rousseau's method; (3) Kennelly's diagram; (4) simplified Kennelly's diagram; (5) graphical method of Weinbeer; (6) ordinate-paper method of Kilmer; (7) quadrant method of Macbeth; (8) slide-rule method of Weinbeer.—*Elek. Anz.*, Feb. 14.

Generation, Transmission and Distribution.

Steam Turbines.—J. Mathivet.—In a central station containing a number of steam turbines of equal rating the problem may arise whether it is more advantageous to distribute the load of the station equally over all turbines or to run them all except one fully loaded and let the last one be loaded according to the requirements at each moment. With reciprocating

engines there is no such problem, since in order to maintain synchronism it is important to distribute the load equally over the different engines. With steam turbines, on the other hand, it is easy to maintain parallel operation of two unequally loaded groups by a very simple regulating device. Among the conclusions reached by the author is the following: If the generating station consists of several turbo-generators and their individual steam consumption varies as a linear function of the instantaneous power, then the total consumption of steam of the whole set for a given load of the plant is independent of the distribution of this load among the different turbo-alternators. In practice, however, it is important to consider how far these assumptions hold true.—*La Lumière Elec.*, Feb. 20.

Electric Motors in Cement Mills.—C. C. BATCHELDER.—An illustrated article in which the author first describes the different machines used in cement plants, such as crushers, rotary kilns, tube mills, etc. Practically all of them demand at least full load when starting. This requirement is fulfilled by the use of compound-wound field coils with direct-current motors, and occasionally by the use of high-resistance secondaries with squirrel-cage induction motors. For very large induction motors it is better to use machines of the type in which resistance is inserted in the secondary circuit while starting, but the horse-power above which this practice becomes advisable varies considerably. In cement plants the tendency is to use squirrel-cage motors up to somewhat larger rating than would ordinarily be recommended, because, where operating conditions are as severe and continuity of operation is as important as in this industry, their simplicity and ruggedness more than counterbalance the better starting characteristics of the slip-ring type of motor. It is advisable to operate the motors at an e.m.f. not less than 440 volts and preferably 550 volts.—*Gen. Elec. Rev.*, March.

Electric Pumping.—A fully illustrated description of an electrically operated pumping and air-compressing installation at Harland & Wolff's shipbuilding yard, in Belfast. The power station supplies both three-phase alternating current at 440 volts, 57 cycles, and continuous current at 220 and 440 volts. The pumps are each driven by a shunt-wound motor capable of developing 200 hp, but the pumps deal entirely automatically with the very variable demand for water according to the level of the water in the hydraulic accumulator. The feature of the arrangement is the use of the Ward Leonard control system for the pump motors, and the provision of special motor-generator sets. Each pump motor is connected direct to one of these generators and by controlling the field of the generator by a regulating field rheostat, automatically worked by the accumulator, to which it is mechanically connected, the voltage generated and applied to the pump-motor armature can be varied from 0 to 440 volts, which produces a speed variation of 0 to 60 r.p.m. on the motor. The pump motors are separately excited at 220 volts. Starting losses are entirely avoided, and since the accumulator takes up any sudden fluctuations in the demand, the speed of the pumps corresponds to the average demand for water at any time, while the momentary fluctuations on the power station are quite small.—Lond. *Electrician*, Feb. 26.

Electric Crane.—An illustrated description of a 50-ton electric crane installed at a dock in England. It is equipped with four motors worked at 440 and 220 volts direct current.—Lond. *Elec. Eng'ing*, Feb. 25.

Electric Winding.—G. HOOGHWINKEL.—An illustrated description of the electric main-shaft winding plant at the Maritime pit of the Great Western Collier Company, near Cardiff. The winding drum is coupled to a slow-speed, three-phase induction motor, and the flywheel equalizer consists of a direct-current machine acting through the medium of a rotary converter.—Lond. *Elec. Eng'ing*, Feb. 25.

Electric Power in a Bleaching Plant.—BACHRACH.—An illustrated description of the electric light and power installation of a bleaching and dying works in which the task was to change as little as possible in the existing machine-tool equipment.—*Elek. Zeit.*, Feb. 25.

Small Motors.—C. H. SCOTT.—An illustrated description of the small-motor department of the General Electric Company at West Lynn, Mass.—*Gen. Elec. Rev.*, March.

Traction.

Electric Ferry-Boat.—The conclusion of the illustrated description of the electric ferry-boat running between Godesberg and Niederdollendorf across the River Rhine. This double-screw boat has a battery of a capacity of 335 amp-hours, when discharged in one hour at a mean voltage of 295. It has a capacity of 645 passengers and also transports carriages. The total first cost of the ferry-boat was $27,750; that of the bridges for landing the passengers was $12,750. The energy consumption of a trip across the river (the width of which is 400 m) is 4.3 kw-hours. In the preceding year the ferry service was carried out by two gasoline launches, but with the electric ferry-boat the receipts increased 60 per cent over the preceding year. Tables are given of the cost of operation.—*Elek. Zeit.*, Feb. 25.

Rates of Acceleration.—F. W. CARTER.—An abstract of a paper read before the Rugby Engineering Society in which the author drew attention to the relative importance of the rates of acceleration in different classes of railway service. After showing the necessity of a high value on urban and suburban lines, the author contends that the single-phase system is, on this account, less suitable for such work than is the direct-current system.—Lond. *Elec. Eng'ing*, Feb. 25.

Interurban Railroad.—MEISSNER.—An editorial discussing the proposed electric railroad from Cologne to Dusseldorf.—*Elek. Zeit.*, Feb. 25.

Steel Ties.—A description of a method of B. E. Tilton for calculating the theoretical section of steel ties. It relates to a method of track-section design in which the parts of the roadway are treated like a bridge and its supports.—*Electric Railway Journal*, March 6.

Installations, Systems and Appliances.

Swiss Central-Station Statistics.—Statistical tables on the central stations of Switzerland for 1907. The statistics refer to 607 central stations, of which 238 generate their energy exclusively themselves; 57 stations have their own generating plant, but also buy energy from outside works; 312 buy their total energy from outside works. Only 266 stations have given detailed information concerning their equipment; the following figures relate only to these 266 stations. Slightly above 50 per cent of them are pure water-power stations, while 37.6 per cent contain both water turbines and heat engines. The first cost of stations of different size per kilowatt of rating—without storage batteries—is given in the following table:

Rating, without storage batteries, kw.	Number of stations.	First cost in francs, per kw. (1 franc = 20 cents). Prime movers and accessories.	Electric equipment (without batteries).	Total cost.
0 to 100	66	970	1,290	2,260
101 to 500	57	815	835	1,650
501 to 1,000	18	645	612	1,257
1,001 to 2,000	10	643	758	1,401
2,001 to 3,000	4	818	752	1,570
3,001 to 4,000	5	540	500	1,040
5,001 to 6,000	3	700	1,048	1,748
6,001 to 10,000	6	805	623	1,428
0 to 1,000	141	752	778	1,530
1,001 to 10,000	28	668	657	1,325

Figures of first cost in which the stations are classified according to the type of prime movers are given in the following table:

Number.	Kind of prime mover.	First cost in francs, per kw. (1 franc = 20 cents). Prime movers.	Electric equipment (without batteries).	Total cost.
87.	Solely water turbines	588	449	1,037
65.	Water turbines and heat engines	704	620	1,324
15.	Solely gas engines	1,110	2,028	3,138

Twenty-three per cent of all stations use direct current; 9 per cent single-phase current; 30 per cent three-phase current; 23 per cent a combination of single-phase, two-phase and three-phase current; and 15 per cent a combination of direct current and alternating current. Alternating-current works use the following frequencies: 50 (69 per cent); 40 (14 per cent); 44 4/5 and 45 (each 1 per cent); 46 2/3 (2 per cent); 48 (2 per cent);

60, (2 per cent); 38 2/5, 53, 58, 62½, 70 (each 1 per cent); 33 1/3 and 50 (1 per cent); 52 and 50 (1 per cent); 53 and 50 (1 per cent). The e.m.f. for lighting was 120 volts in 30 per cent of the stations, 200 in 20 per cent and 220 in 18 per cent. In alternating-current works the high tension was between 3000 and 4000 volts in 23 cases, between 2000 and 3000 volts in 22 cases, between 1000 and 2000 volts in 20 cases, and between 4000 and 6000 volts in 17 cases. The highest voltages were 11,000; 13,500; 16,000 (three works); 20,000 (two works); 25,000 (five works), and 32,000 (one works). One of the direct-current stations operates at from 5000 to 6000 volts, two at from 8000 to 9000 volts, one at from 14,000 to 15,000 volts, and one at 25,000 volts. The number of the consumers of the 249 stations was 141,820, with 47,644 meters.—*Elek. Anz.*, Feb. 7.

Central Stations and Private Plants.—A discussion of the relative economical advantages of buying electrical energy from a central station or generating it in a private plant. Various tables of cost are given for plants of various sizes, and it is concluded that the relative advantages of a private plant, and the purchasing of energy, depend mainly upon the size of the installation and its load factor. On the whole, with the increasing size of generating stations, it may be taken that under 1000 hp it seldom pays to erect a private plant in a neighborhood where there is a power company of any magnitude; between 1000 hp and 5000 hp it would only pay in cases where the power company was working very inefficiently or liable to expend very heavy capital to reach the consumer. That these considerations are being more and more realized is shown by the fact that it is the almost universal practice on the northeast coast of England for private manufacturers or colliery owners to obtain electric power except by purchase.—Lond. *Engineering*, Feb. 26.

Storage Batteries in Steel Mills.—J. L. Woodbridge.—In steel mills storage batteries are of great importance as the power load is of an exceedingly fluctuating character. The author describes several typical installations of storage batteries in American steel plants, such as that of the Carnegie Steel Company at Youngstown, Ohio.—*Gen. Elec. Rev.*, March.

Wires, Wiring and Conduits.

Insulation and Wiring.—W. H. F. Murdoch.—"When one considers that in ordinary installation work the actual insulation of the wires themselves is of very little effect in raising the insulation of the installation as a whole, one cannot avoid the conclusion that a great deal too much stress is laid upon the wires and their insulation and testing." The insulation of a building seems to depend more on the insulation of ceiling rosettes, lamp-holders, etc., than upon anything else.—Lond. *Elec. Rev.*, Feb. 26.

Units, Measurements and Instruments.

Units.—Brylinski.—A paper presented before the International Society of Electricians in Paris. The author points out that the electrostatic c.g.s. system, the electromagnetic c.g.s. system and the practical system used by electrical engineers are only elaborations of the metric system. The systems of practical units employed in electricity and magnetism do not agree altogether, and it is important to harmonize them, but as this involves considerable difficulty it may be adjourned without many inconveniences. Field density and flux density are probably different units and have different dimensions so that it would be advantageous to differentiate between them by using different symbols. Under present conditions it seems advisable to adopt as a fourth fundamental unit the quantity of electricity. There is also an abstract of a paper by Berthelot, who makes some critical remarks on Brylinski's suggestions.—*L'Industrie Elec.*, Feb. 25.

Meters.—A note on a recent British patent (10,893, 1908; Feb. 18, 1909) of Chamberlain & Hookham, Ltd., and S. H. Holden, for a watt-hour meter of the type in which a metal disk rotates in mercury between the poles of an electromagnet. The magnetic circuit is formed of iron washers threaded on brass rods and separated by thin layers of paper. This division of the core into a number of short lengths decreases the effect of residual magnetism, and, by the use of a nearly complete magnetic circuit, the meter is rendered less susceptible to external magnetic fields. A special bracket for the support of the counting train, brake magnets, and the upper bearing for the armature spindle, which renders access to the mercury chamber easy, is also described.—Lond. *Elec. Eng'ing*, Feb. 25.

Telegraphy, Telephony and Signals.

Electrolytic Detector.—E. Reyval.—An article on the electrolytic detector and its use in wireless telegraphy and telephony.—*La Lumière Elec.*, Feb. 20.

Miscellaneous.

Revocation of British Patents.—Following the recent revocation of the Bremer arc-lamp patent, the Hoegner flame-arc lamp patent has now also been revoked in England. In giving his decision the Comptroller "held that, in considering whether a patented article was manufactured mainly or exclusively abroad, he must take into account the numbers of that article which are manufactured abroad in accordance with the patent, but not imported."—Lond. *Elec. Eng'ing*, Feb. 25.

Patent Laws.—E. Adler.—A lecture held in the Electrical Society of Vienna on several points in the international patent law. *Elek. und Masch.* (Vienna), Feb. 7.

Ignition of Gas Engines.—An illustrated review of various recent electrical devices for ignition for internal-combustion engines.—*Elek. und Masch.* (Vienna), Feb. 7.

NEW APPARATUS AND APPLIANCES

Flaming-Arc Lamps.

By Theodore Stavé.

Perhaps no other form of illuminant has made such rapid progress in this country during the past year as the flaming-arc lamp. It is only about three years since this type of lamp began to be considered seriously here, though the principal cities in Europe had previously adopted the flaming arc for the illumination of main thoroughfares, and almost every large German manufactory of importance had taken advantage of its economy.

As far back as 1870 successful experiments were made in Paris with a type of flaming-arc lamp known as the "Lampe-Soleil," which was hailed as a wonderful improvement in arc lamps. It was, however, soon abandoned on account of the high cost of carbons and the difficulty met in their manufacture, and it is only comparatively recently that it has been revived on account of important improvements made in the impregnated carbon. One of the principal drawbacks to the impregnated carbon is that upon cooling it becomes coated with a slag which is non-conductive and thus prevents the striking of the arc. This trouble is more noticeable in the case of vertically aligned than of downwardly inclined carbons. Through very recent developments, however, carbon makers have been able to minimize this defect to such an extent that even vertical carbons will strike up entirely satisfactorily after cooling.

It has thus been possible to develop a type of flaming-arc lamp with vertical carbons, which type has the advantage of lower energy consumption and of enabling larger carbons to be used, thus considerably increasing the hours of burning. The light distribution is also more favorable, as the maximum rays are at an angle of 60 deg. as compared with an angle of 45 deg. in the case of the inclined-carbon lamps.

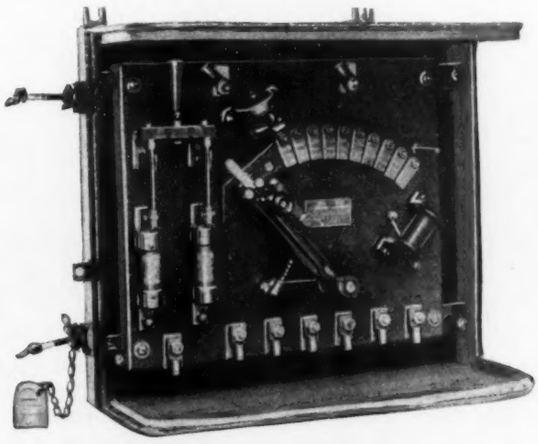
These recent improvements in flaming-arc lamps have had a very beneficial effect on the electric lighting industry, as the need has become greater every day for more efficient illumination than with the ordinary enclosed arc lamp, which has been almost exclusively used for the last 15 years in this country wherever large areas have to be illuminated. It will not be very long before the large consumers of electric light will realize that a saving of 60 to 70 per cent can be obtained by the replacement of the old types of arc lamps by the modern flame arc, either in more light for the same expenditure or in actual saving in the cost of present lighting.

For the lighting of foundries and docks the flaming-arc lamp is of the greatest value on account of the penetrating character of its light. It has been repeatedly demonstrated that however foggy outdoors or smoky in foundry or mill, the yellow rays of the flaming-arc lamp will penetrate the murky atmosphere better than any other source of light. The result of replacing ordinary enclosed-arc lamps, which, as is well known, emit a considerable percentage of ultra-violet rays, with flaming-arc lamps is astonishing in effect. This is due principally to the richness in amber rays emitted from the flaming arc. It is a well-known fact that the amber rays are the least offensive since they have a minimum of the injurious rays of high refrangibility. This fact extends the usefulness of the flaming arc from its original employment for purely advertising purposes to numerous industrial purposes, and particularly to the lighting of foundries, mills and machine shops.

Motor-Starting Box for Battleships.

The accompanying illustration shows a controlling panel built by the Ward Leonard Electric Company, of Bronxville, N. Y., for battleship service. Aside from ordinary requirements, devices of this type must also not introduce fire hazard or take up much space. The panel consists of a line switch and fuses and motor starter with no-voltage release for use in regulating motors driving ammunition hoists. The no-voltage release is connected across the line and is independent of the current passing through the motor. The wire used for resistance is encased in enamel and is thus immune from atmospheric conditions.

The various segments are renewable from the face of the panel, and in order to prevent arcing an independent spring-operated circuit-closing switch is used which opens the circuit with a quick break. The moving contact on the controlling arm



MOTOR-STARTING BOX.

consists of a self-aligning renewable skate shoe. The starter is designed for motors rated at from 3 hp to 5 hp. The entire outfit is set into an enclosing case made up of cast-metal back and sides with a hinged cover of sheet brass. The line lead wires are led into the box through pipes screwed into the top of the box and the motor leads are led from the bottom of the box in the same manner. The rheostat is claimed to be fool-proof, and is characterized by compactness and lightness in weight.

Direct-Current Watt-Hour Meter.

The Duncan Electric Manufacturing Company, of Lafayette, Ind., has brought out a new watt-hour meter for direct-current circuits, the essential features of which are illustrated in Fig. 1 herewith. The back, magnet support and arch holding the series-field coils, compensating coil, upper bearing, brushes and compensating switch are made of pressed sheet brass, and the

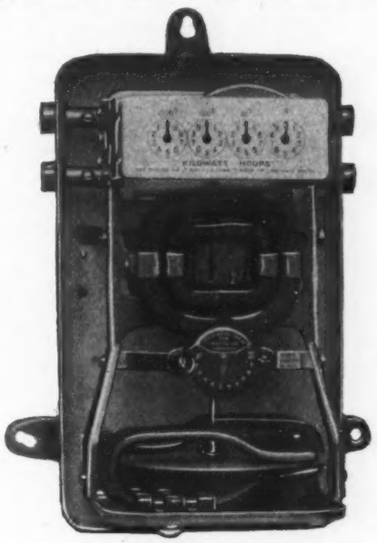


FIG. 1.—WATT-HOUR METER.

gear wheels and pinions for the registering train are cut by automatic machinery, which renders the possibility of their binding remote. The cover, which is dust- and moisture-proof, is held in position by wing-headed screws which cannot drop out. No change has been made in the multipoint switch method of compensating for friction or vibration which is used throughout the entire line of instruments. Any degree of compensa-

FIG. 2.—WATT-HOUR METER.

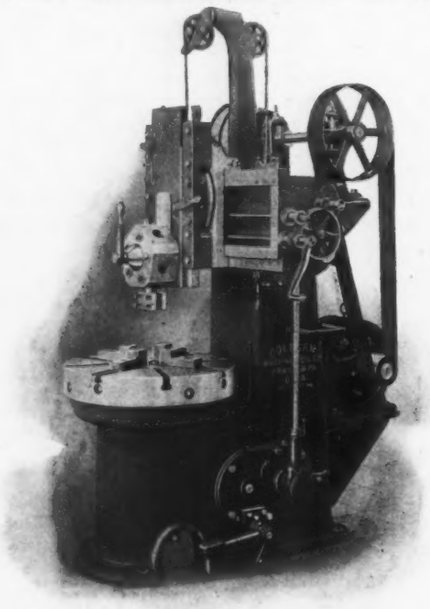
tion is obtainable by simply turning the switch lever over one or more contacts. A high turning moment is possessed by the instruments, the smallest sizes having a torque of not less than 200 mm grams, it is claimed, while the larger meters have a torque as high as 600 mm grams. The steel employed for the magnets is the same as used by the company for many years

and possesses high retentivity and permanence. For the 110-volt meters the resistance unit is of the cartridge type. The cartridge is 4 in. long and 1 in. in diameter and is held by clips which render its removal or insertion a matter of a few seconds. The unit is embedded within a fireproof composition. The other Duncan features, such as the visual bearing, the threadless jewel post, etc., are still retained, as well as the old form of armature. The latter is wound with 8000 turns of No. 40 silk-insulated wire and is mounted upon a light framework. The brushes are of the direct-tension type. To facilitate the work of testing, each meter is marked with the number of watts required to make 1 r.p.m.

The company has also brought out a full line of astatic switchboard meters in which the series-field coils are so arranged that they oppose each other and within them is placed a four-pole armature with the brushes set on the commutator at an angle of 90 deg. External fields are said to have very little effect on this type of meter. Tests made by bringing busbars as near the meter as its mechanism will permit are said to have shown an error not exceeding 2 per cent. The larger sizes of house meters also embody the features of the switchboard meters.

Thirty-Four-Inch Vertical Boring Mill.

In the accompanying illustration is shown a boring mill adapted from a standard belt-driven outfit to motor drive by the addition of a countershaft and a constant-speed, 5-hp, Westinghouse direct-current motor mounted on special brackets at the rear of the machine. The speed changes are made mechanically by the cone pulleys and by the gears in the base. There are in all 16 different speeds which give the table speeds from 2⅜ r.p.m. up to 68⅜ r.p.m. The boring mill is equipped with a five-sided turret which permits five or more operations

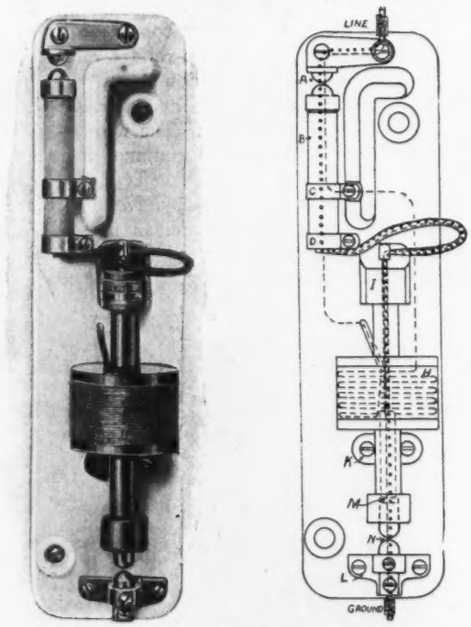


BORING MILL.

to be performed on one piece of work in any direction without stopping the machine or changing a tool. The turret is mounted on a vertical slide which may be swiveled to any angle up to 30 deg. on either side of the perpendicular. This arrangement is accomplished by first locking the weight by means of the clamp on the sheave wheel bracket on top of the machine and then by turning the crank on the vertical feed shaft. The feeds are positive, gear driven, for both vertical and horizontal motions and are provided with adjustable automatic stops. There are eight available feeds for any speed of the table. A special attachment is provided for thread cutting which may be readily applied and, if desired, can remain permanently attached to the machine without interfering with its regular operation. The boring mill, which is especially adapted to automobile work, although it can be used in different industries, is manufactured by the Colburn Machine Tool Company, of Franklin, Pa.

Lightning Arresters for Alternating-Current Work.

Several new, although not untried, features are found in the lightning arresters of the Electric Service Supplies Company, of Philadelphia, Pa., designed for alternating-current circuits of from 1200 to 20,000 volts. Among these may be mentioned the following: The arrester does not depend for its successful operation on the spark-gaps alone, nor upon the use of resistance alone to prevent the current from following the discharge, nor yet upon combined air-gaps and resistance. An automatic circuit-breaker opens when the discharge occurs at the full-voltage point of the alternating wave or when the air-gaps are corroded and dirty. When the discharge occurs at or near the no-voltage point, the two air-gaps and the series resistance prevent the normal current following the discharge. The company states that experience has shown that the circuit-breaker is called into operation in but one out of about five discharges. The total air-gap distance in the 2500-volt type is 0.095 in., and the non-inductive series resistance averages 250 ohms. The line connection is at one end of the arrester base and the ground connection at the other end, so that parts having the greatest potential difference are widely separated and flash-overs and short-circuits because of dirt or moisture on the arrester base are prevented. The total air-gap distance in the 3750-volt arrester is 0.19 in. and the non-inductive resistance has a value of 500 ohms. The construction and operation of the arresters will be readily understood by reference to Fig. 2.



FIGS. 1 AND 2.—LIGHTNING ARRESTERS.

One of the discharge points is mounted on the end of the rod *B*, which is held in position by clamps *C* and *D*. The distance from *C* to the upper discharge point *A* on the resistance rod is 2¼ in. The solenoid cut-out coil *H* is supported by brackets *I* and *K*, the latter being designed to give a surface distance on the porcelain base of 2¼ in. between *K* and the lower discharge point bracket *L*. This gives a total surface distance of 5 in. on porcelain, which is considered ample for 2500 volts. To reduce still further the possibility of the discharge jumping between parts, the line connection is at the top and the discharge passes downward in practically a straight path to the ground connection. This path is indicated by the round dots in

the diagram; the dashes showing the path of normal current. It will be noticed that the discharge goes through the section of the resistor *C-D*, the normal current being shunted through the solenoid coil *H*. This energizes the armature *J* and opens the circuit between the discharge point *M* and the lower end of the armature. The discharge point *M* is stationary so that the air-gap at *N* is not changed by the operation of the arrester. The arc is thus drawn out until broken inside the tube, which is said to be practically air tight. The upper end of the discharge point *M* is of carbon. For higher voltages the arresters differ in width and length of base and have additional air-gaps. The cut-out is automatic and restores itself by gravity. It is claimed to interrupt the flow of normal current positively and thus to limit the amount of attention necessary for the discharge points to occasional inspection.

Direct-Current Flaming-Arc Lamp.

Some of the distinctive features of the "Aurola" flaming-arc lamp manufactured by the Siemens-Schuckert Works and marketed in this country by the Charles L. Kiewert Company, of Milwaukee, Wis., are indicated in the following: The direct-current lamp illustrated in Fig. 1 is tilted slightly in order to show important details. The operating mechanism consists of an armature swinging between shunt and series magnets. Attached to this armature is a frame containing a single chain wheel, reduction gear, escapement for the feed and the control of the arc distance. Characteristic of the design is the employment of only one strong, flat link chain (Fig. 3), consequently only one chain wheel is necessary. This detail insures a high degree of reliability in service and at the same time facilitates trimming operations. The button with which the carbon holders are lifted (see Fig. 3 in chain tube) is on the outside of the lamp and handy for the trimmer. The wires leading to the blow-out magnet, which is placed within a well-ventilated collar, are concealed inside of the carbon-holder guide tubes. The automatic cut-out not only interrupts the shunt, but the series circuit as well as soon as the carbons have burned away. The upper and lower castings are rigidly connected by six strong tubes. The ventilation of the globe (Fig. 2), is very efficiently arranged by an air-admitting ash tray and a long draft-producing sleeve. The current of air sweeps the inner surface of the globe and carries off any particles which might settle. The globe is thus kept clean and absorption of light from deposit is a minimum. The lamp is built for 10 amp and two burn in series across a 110-volt circuit. The steadiness of the light is especially good as the feeding intervals are small and the variation of the arc distance is kept at a minimum.

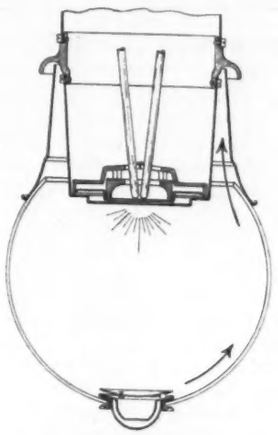


FIG. 2.—GLOBE VENTILATOR.

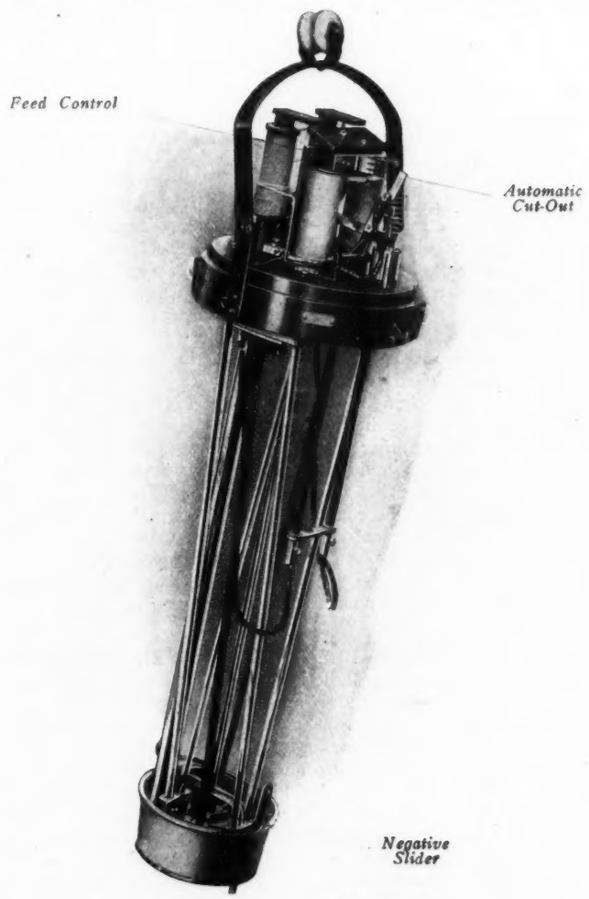


FIG. 1.—DIRECT-CURRENT LAMP.

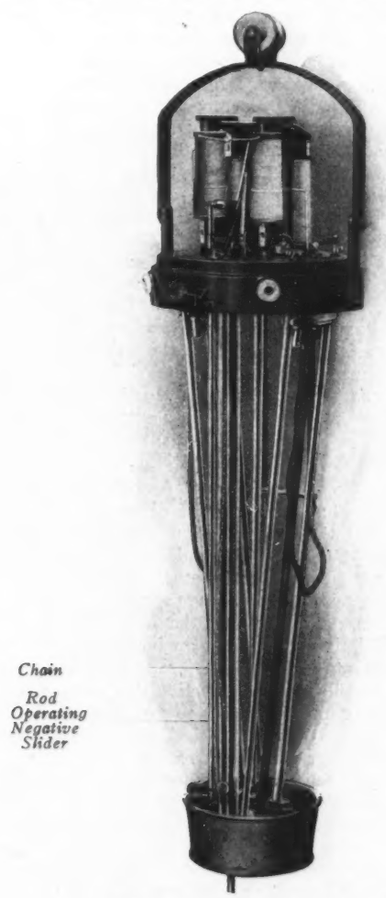


FIG. 3.—DIRECT-CURRENT LAMP.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

There has not been any material change in the general condition of business during the past week further than the development of a rather better tone and sentiment among wholesalers and jobbing interests. Actual sales have not been much improved. The near approach of the spring season and of Easter have, of course, augmented to a considerable degree the business of the retailers. In fact, shopping, in dry goods and millinery lines, has been quite active all over the country. This has been reflected by some improvement in the demand upon jobbing houses, but the buying is still marked with extreme conservatism. The export trade is very much smaller than had been anticipated, and this is attributed largely to the maintenance of high prices in this country. The unsettled condition of the coal trade adds to the general depression of business. A fair degree of activity has been developed in iron and steel industries by the recent reductions in price, but the competition in this branch of trade is particularly acute. Contracts are being taken at very low prices and promises for profits in this line of business are not particularly encouraging. The best demand that has developed has been for structural material. Rails and car equipments continue to be very dull. Prices for wire have hitherto been maintained, but it is currently reported that cuts will be made within the next few days unless business improves. The large electrical manufacturing concerns report that the steel price war and the weakness of the copper market have resulted in a marked falling off in orders for electrical apparatus. Although the companies fully expected to be operating on an 85 per cent basis by this time they are in reality only operating on a basis of between 55 and 60 per cent of their capacity. The February report for building, from 95 of the principal cities, shows a gain of 15.6 per cent over January, and a gain of almost 100 per cent over February of last year. Reports from the winter wheat crop are rather more favorable than heretofore. General rains through Texas and the Southwest have done much to benefit the gowing crops. The promise of good yields of all kinds comes from the Pacific slope. Collections are somewhat improved over February. They are not now giving any uneasiness or trouble to the transaction of business. Business failures for the week ended March 11, as reported by *Bradstreet's*, were 254, against 219 the week previous; 278 in the similar week of 1908; 186 in 1907; 187 in 1906, and 186 in 1905.

THE COPPER MARKET.

The report of the Copper Producers' Association which was made public last week had the effect of depressing the market to such an extent that the quotations on metal exchange were marked down ¼ @ ⅜ cent on all grades. The figures which were made public announce that the stock of marketable copper in the United States amounts to 173,284,248 lb. This is an increase of almost 30,000,000 lb. over the figures given out the month previous. This is not as great an increase as many statisticians had figured out. In fact, it is pretty generally believed that the term "marketable" is so restrictive that large quantities of copper which are practically ready to go on the market are not counted in the figures of the association. It is thought that the actual stocks of copper which can readily be placed on sale in this country are far in excess of the figures given out, although the latter probably correctly represent the refined metal held in producers' hands. The stocks carried in Europe are enormous and it is the weakness of the market there that has brought about the demoralized condition in this country. The truth of the situation is that the actual condition of the copper market is finally being understood and that the powerful financial interests which have so long sustained prices are either unable or unwilling to continue the work. There is as yet no effort being made to curtail the heavy production; domestic consumption is very light and has not as yet been stimulated by the lower prices and the speculators in Europe have almost as heavy a burden as they can carry. There is every reason to anticipate that the movement in March will result in a further accumulation, in producers' hands, of more than 30,000,000 lb. So far there has been no agreement made to curtail production and in the present temper of the producers such an agreement is unlikely. The output may be reduced, but it is much more likely to be by the voluntary contraction of those miners who find 12-cent copper unprofitable than by any mutual agreement among the principal producers. Miners who can market copper at a profit at 10 cents see no reason why they should curtail their business in order to protect others not as fortunately situated. On the other hand, it is not likely that prices will be allowed to go much lower and present prices should, in the near future, stimulate buying. The margin of profit for many producers is almost reached. Already buying for export has been considerably stimulated and the selling agencies report some revival in inquiries from domestic consumers. Exports since March 1, part of these shipments has gone to the Continent. Prices part of these shipments have gone to the Continent. Prices quoted on the Metal Exchange March 15 were:

Lake	12½ @ 12¾
Electrolytic	12⅛ @ 12¼
Castings	12 @ 12⅛

London prices were as follows:

	Noon.	Close.
	£ s d	£ s d
Standard copper, spot	55 2 6	54 15 0
Standard copper, futures	55 17 6	55 11 3
Market	Weak.	Weak.
Sales of spot		900 tons
Sales of futures		1,500 tons

Extreme fluctuations for this year:

	Highest.	Lowest.
Standard	....	....
Lake	14.55	12.62½
Electrolytic	14.25	12.20
Castings	14.12½	12.07½
London, spot	£64 2 6	£54 15 0
London, futures	64 17 6	55 11 3
London, best selected	67 15 0	59 5 0

ALLIS-CHALMERS COMPANY'S ORDERS INCREASING.—The business of the Allis-Chalmers Company is reported to be continuously improving. The volume of orders booked during the month of February was approximately 15 per cent less than that for January, but this was attributed to the fact that owing to the many holidays there was a smaller number of business days in that month. There was practically no difference in the average daily business of the two months. The total business booked since the first of the year is about 140 per cent greater than for the same period last year. The greater part of this business has been for mining and pumping machinery, although there have been quite satisfactory orders received for turbines and gas engines. It is stated by the officials of the company that the question of dividends on the preferred stock will not be considered at this time, but in view of the fact that the physical condition of the properties is better than it has ever been before, it will not be a great while before these shares are placed upon a dividend basis. The balance sheet of the company on Dec. 31, 1908, shows assets amounting to $27,525,367.

SEEKING HYDRO-ELECTRIC POWER FOR NITRATE PLANT.—The bulletin of the Bureau of Manufactures of the Department of Commerce and Labor announces that representatives of European manufacturers of air nitrates for fertilizers are endeavoring to find in this country large water powers in order to establish plants here. The publication says: "An industry of this kind is needed, as the imports of Chilean nitrate of soda now amount to $14,000,000 a year. Difficulty is being experienced, however, in securing suitable water power at reasonable cost. Governments of other countries are said to be offering inducements for the location of the extensive nitrate mills which the company proposes to erect."

RUMORED CHANGE FROM ALTERNATING TO DIRECT CURRENT TRACTION.—It is rumored that the Washington, Baltimore & Annapolis Railroad will substitute a direct-current-system for its present single-phase alternating-current traction equipment.

WESTERN ELECTRIC MANUFACTURING POLICY.—It is understood to be the present policy of the Western Electric Company to consolidate all of its manufacturing operations at the Hawthorne works, just outside of Chicago. The South Clinton Street buildings of the company, in Chicago, containing the offices, where some light manufacturing is still carried on, are for sale, but will probably be utilized for the company's office purposes for some time to come. The large telephone cable manufacturing plant, which has a capacitly of 150,000,000 conductor-feet a week, has been operated as a branch of the Hawthorne works for several years. Mr. H. F. Albright is general superintendent, in charge of all manufactures. He is located at Hawthorne, as is also Mr. H. M. Sage, the assistant general superintendent. The names of the heads of the manufacturing departments at Hawthorne are Mr. A. C. Dodge, superintendent of telephone apparatus shop and also of cable and rubber insulating shops; Mr. C. M. Campbell, superintendent of power apparatus shop; Mr. O. C. Spurling, plant engineer. Mr. F. L. Gilman, superintendent of the New York shop, reports to Messrs. Albright and Sage at Hawthorne. The manager of the Chicago office for sales is Mr. F. V. Bennis, and the assistant managers are Messrs. F. A. Ketcham and L. J. Baldwin. Mr. W. P. Sidley, the vice-president and general counsel of the company, is also located in Chicago.

ELECTRICAL CONCESSION AT SAO PAULO, BRAZIL.—The Mayor of the city of Sao Paulo, Brazil, has recently granted to Guinle & Company—who are the Brazilian representatives of the General Electric Company and prominent developers of hydro-electric properties—a concession which gives them the right to sell electrical energy in the city and to use the streets for their transmission cables. This insures the construction of an extensive hydro-electric plant near the city on the river Itapanhau, at which it is expected that at least 60,000 hp will be developed. This is the third important hydro-electric plant that Guinle & Company will eventually develop in Brazil. The plant near Nictheroy and Rio de Janeiro is now delivering power in the former city and plans have recently been made to increase the capacity from 50,000 hp to 70,000 hp. The plant at Bahia, now operated by steam, may soon have a hydro-electric development amounting to 50,000 hp. Rights to three waterfalls have been secured for this purpose. Speaking of the Sao Paulo project, a representative of Guinle & Company in New York said: "We expect, as soon as our plant is completed, to do a great deal toward developing the industries of the city. We will deliver energy for lighting at 6.1 cents per kw-hour and for power at 3 cents. These rates are but small fractions of those now prevailing in the city."

NEW POWER PLANTS FOR MEXICO.—Senor José Zelaya, a Mexican banker and mine owner, has been in New York during the past week financing a consolidation of a number of mining properties. The Mexican financier says that a good part of the $25,000,000 in gold recently bought by the banks of the City of Mexico will be circulated among farmers and fruit growers, who are rapidly taking up lands that have been irrigated by United States capital. He also says that plans are being drawn in Mexico for hydro-electric undertakings to the amount of about $18,000,000, which are to be operated by machinery made in the United States. The expenditure referred to includes the main canals, irrigating ditches and reservoirs. In the Chihuahua mining district there has been a remarkable example of the great value of irrigating arid lands, furnished by the promoters of a colony from the United States. These investors purchased large tracts at an average of $1.50 an acre. After the irrigating projects were developed the value of this land increased to from $75 to $100 an acre. Bountiful crops are now being raised, for which the adjacent mining camps furnish a quick cash market. It is the example of this promotion that has inspired the organization of a score of hydro-electric projects.

SIEMENS & HALSKE FLAMING-ARCS.—Through its American representative, Dr. Karl Georg Frank, the Siemens & Halske A. G. is meeting with very satisfactory returns from the sales of flaming-arc lamps in this country. It reports that inquiries for these lamps are being received in great numbers and that many towns and cities are considering their use for municipal lighting. The company has recently sold 40 "Aurola" lamps to the Ringling Circus, which will open at Madison Square Garden, New York, next week. These lamps are 3000 cp and will be served with current by the New York Edison Company. They will be used by the circus throughout the season for lighting its immense tents. Dr. Frank says that from the rapidity with which orders are being received he will sell 5000 flaming-arc lamps during the year 1909. Another product of the Siemens & Halske plant that is attracting considerable attention in America is its fire alarm system. The company makes a specialty of compact equipments of this character, and pays particular attention to ornamental street boxes. Quite a number of the smaller cities, both in this country and in Canada, have purchased installations.

CHICAGO NAVAL TRAINING STATION LIGHTING PROPOSALS.—Proposals will be received at the Bureau of Navigation, Navy Department, Washington, D. C., until noon, March 24, for outside lighting at the Naval Training Station, North Chicago, Ill. It is intended to install a complete system of outside lighting at this new training station on Lake Michigan. The contract will include labor and material, and poles, wires, conduits, incandescent lamps, brackets, globes, etc., with connection to the cables placed by others. No arc lamps are included in the contract. Detailed information may be had from the chief of the Bureau of Navigation, Navy Department, or from the commandant at the Naval Training Station, North Chicago, Ill.

FOURTH HUDSON COMPANIES' TUNNEL BORED.—The last of the four tunnels being constructed under the North River by the Hudson Companies was bored through on March 11. This tunnel is known as the Fulton Street Tube, and extends from the Hudson Terminal Buildings in lower New York to the Pennsylvania Railroad Station in Jersey City. The work of completing the tunnels and laying the tracks will be rapidly pushed forward, and Mr. W. G. McAdoo, the president of the Hudson & Manhattan Railroad Company, promises that his lines will be in operation by July 1. The power house equipment has already been installed, and 90 new steel cars have been ordered, which will be ready for delivery within two months.

PRAGUE, OKLA., CONTRACT OPEN.—Bids will be received by F. M. Newhouse, town clerk, for furnishing material for construction of an electric light plant and water system for Prague, Okla., as follows: Tower and tank, pressure pumps and accessories; motor-driven deep-well pumps, including motors; boilers, steam engine, alternating current generator, switchboard, arc lamps, regulator, transmission line equipment, etc. The Michael Cooke Engineering & Construction Company, of Joplin, Mo., has charge of the construction of the plant.

EXPORT JOURNAL OF MANUFACTURERS' ASSOCIATION.—The National Association of Manufacturers has completed plans for the publication of an export journal, to be printed in both English and Spanish. The publication will be conducted by Mr. James L. Elwell, who for a quarter of a century has been associated with R. G. Dun & Company.

NAVAL ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts of the United States Navy Department asks proposals for 70,000 ft. of insulated conductor and six transformers. Bids are to be opened March 23.

SPRINGFIELD, O., CENTRAL STATION ENLARGEMENT.—The Springfield Light, Heat & Power Company is preparing plans for the construction of a large addition to its plant.

Financial Intelligence.

THE WEEK IN WALL STREET.

The condition of the stock market during the past week was one of extremely dull trading, with prices rather firm and well-maintained. This is explained by the fact that the stagnation in commercial circles is discouraging to traders while, on the other hand, the unusual cheapness of money relieves any pressure to sell. There have been few instances to affect the market either one way or the other. The uncertainty as to the tariff continues to be a deterrent to any activity. Until this matter is settled there is not likely to be any considerable expansion in trading. The final dismissal of the case against the Standard Oil Company would, in ordinary times, have been eagerly seized as a bull argument. When the heavy fine was imposed upon the company by Judge Landis the stock market was seriously affected. In fact, there are many who date the beginning of the present lengthened period of depression at this occurrence. The dismissal of the case had not only been anticipated but there has been for several months a feeling that corporation baiting is over, for the present at least. One demoralizing feature in

the market is the condition of the copper metal trade. It seems very evident, unless this is improved speedily, that the earnings of copper shares cannot be maintained on their present basis. The weekly and monthly reports from the railroads show continued improvement, in spite of the fact that industrial plants are being operated on but little better basis than they were a year ago. All of these things tend to develop in the stock market a waiting condition. Investors and traders are not without faith in the future, but they do not see any reason why they should engage actively in business until there is some revival in other lines. It is well-known that many large projects are on foot; that plans have been drawn for extensive developments and that the financing of these undertakings will bring into the market many new issues of bonds and will enliven conditions in money. Whether we can hope for very much in this direction before next fall is uncertain. It will largely depend upon the speed with which the new tariff bill is adopted and the settlement on a fixed basis for the steel industry. In the latter, during the past week, prices have continued to be demoralized and there is active price cutting in order to secure the little business that is offered. Money continues to be plentiful and cheap, and call loans on March 15 were quoted at 1¾ @ 2 per cent, 90-day paper at 2¾ @ 3 per cent. The quotations in the table are those at the close March 15.

NEW YORK.

	Mar. 8.	Mar. 15.	Shares Sold.		Mar. 8.	Mar. 15.	Shares Sold.
All.-Ch.	13⅞*	13½*	250	Int.-Met., pfd...	44¼	43¾	50,475
All.-Ch., pfd....	43⅛*	41	300	Mackay Cos....	72¾	73¼*	600
Amal. Cop. ...	69¼	66⅝	138,025	Mackay Cos., pfd.	71¼	71¾*	200
Am. D. T.....	35*	35*	——	Manhattan Elev.	146*	142⅛	250
Am. Loc.	51⅛	50¼	7,980	Met. St. Ry....	25*	25*	——
Am. Loc., pfd..	111¾*	111½*	100	N.Y. & N.J.Tel.	117*	117*	——
Am. Tel. & Cbl.	76*	76½	150	Steel, com.....	45⅛	43¾	293,900
Am. T. & T....	128½	129⅜	5,115	Steel, pfd.....	111⅛	110⅛	7,450
B. R. T.....	72½	70⅜	38,430	W. U. T.....	65½*	65½	460
Gen. Elec.	152*	153¼	750	West'h., com....	78	77	2,470
Int.-Met., com..	15¾	14¾	19,500	West'h., pfd....	110*	110*	100

PHILADELPHIA.

	Mar. 8.	Mar. 15.	Shares Sold.		Mar. 8.	Mar. 15.	Shares Sold.
Am. Rys.	46*	46*	——	Phila. Elec. ...	11¾	11⅜	——
Elec. Co. of A.	12	11⅞	——	Phila. R. T.....	28	27½	——
Elec. Stor. B'ty	46½*	46½	——	Phila. Traction.	91	91	——
E. S. B'ty, pfd.	49*	49*	——	Union Traction.	53⅜	53½	——

CHICAGO.

	Mar. 8.	Mar. 15.	Shares Sold.		Mar. 8.	Mar. 15.	Shares Sold.
Chi. City Ry...	187*	187*	——	Chi. Tel. Co....	132¼	132	——
Chi. Rys., Ser.1.	111*	111*	——	Met. El., com..	19	19*	——
Chi. Rys., Ser.2.	41⅛	48½	——	Nat'nal Carbon.	86*	85½	——
Com. Edison...	109¼	111¾	——	Nat. Carb., pfd.	118¾*	119	——
Chi. Subways...	25¼	25¼*	——				

BOSTON.

	Mar. 8.	Mar. 15.	Shares Sold.		Mar. 8.	Mar. 15.	Shares Sold.
Am. Tel. & Tel.	128⅜	129⅛	——	Mex. Tel.	2½*	2½	——
Cum. Tel.	127*	127½*	——	Mex. Tel., pfd.	5*	5*	——
Edison El. Ill..	253	253½	——	N. E. Tel.	133	135	——
Gen. Elec.	152¼	154	——	W. Tel. & Tel..	7*	7*	——
Mass. Elec. Ry.	14¾	15*	——	W. T. & T., pfd.	77½	77½*	——
Mass. E. R., pfd.	72	70½	——				

*Last price quoted.
Shares sold are for week March 8 to March 13.

DIVIDENDS.

American Telephone & Telegraph Company, quarterly, 2 per cent, payable April 15.

Manila Electric Railroad & Light Company, quarterly, 1 per cent, payable April 1.

Cincinnati Gas & Electric Company, quarterly, 1⅛ per cent, payable April 1.

Duluth Edison Electric Company, quarterly, 1½ per cent, payable April 1.

United Traction & Electric Company, Providence, R. I., quarterly, 1¼ per cent, payable April 1.

West End Street Railway, Boston, quarterly, 1¾ per cent, payable April 1.

Union Traction Company of Indiana, Anderson, Ind., preferred semi-annual, 2½ per cent, payable April 1.

Halifax (N. S.) Electric Tramway Company, Ltd., quarterly, 1½ per cent, payable April 1.

West India Electric Company, Ltd., Jamaica, quarterly, 1¼ per cent, payable April 1.

Springfield (Ohio) Light, Heat & Power Company, initial, 1 per cent, payable April 10.

Massachusetts Lighting Companies, quarterly, 1½ per cent, payable April 15.

Otis Elevator Company preferred, quarterly, 1½ per cent, payable April 15; common, annual, payable April 15 and October 15.

Phelps-Dodge Company, Inc., initial, 2½ per cent, payable March 31.

Bangor (Me.) Railway & Electric Company, quarterly, 1¼ per cent, payable April 1.

Westinghouse Air Brake Company, quarterly, 2½ per cent, payable April 10.

United Gas Improvement Company, Philadelphia, quarterly, 2 per cent, payable April 15.

Manhattan Railway Company, quarterly, 1¾ per cent, payable April 1.

Western Union Telegraph Company, quarterly, ¾ per cent, payable April 15.

Toronto Railway Company, quarterly, 1¾ per cent, payable April 1.

PROBABLE CONSOLIDATION OF ELEVATED RAILROADS IN CHICAGO.—A movement is on foot which has for its object the purchase of the Union Elevated Railroad Company, operating the downtown elevated "Union Loop," in Chicago, and putting it into the hands of a new corporation, which, according to the plan, will lease all the other elevated railway companies using the loop. It is probable that the name of this new company will be the Central Terminal Company. The plan has for one of its features the creation of a guaranty fund of $4,000,000, to guarantee the leases of the subsidiary roads. It is probable that a transfer system within a specified transfer zone will be adopted for all the elevated roads. It is likely that this plan will go through, although the scheme has not received final approval. The "outlying" companies using the Union Loop are the South Side Elevated Railroad Company, Metropolitan West Side Elevated Railway Company, Chicago & Oak Park Elevated Railroad Company and Northwestern Elevated Railroad Company. The general committee of financiers in charge of the plan consists of Messrs. Ira M. Cobe, vice-president of the Assets Realization Company; Samuel Insull, president of the Commonwealth Edison Company, and E. K. Boisot, vice-president of the First Trust and Savings Bank, all of Chicago.

UNION SWITCH & SIGNAL COMPANY.—At the annual meeting of the Union Switch & Signal Company, held in Pittsburgh March 9, the old directors were re-elected with the exception that Mr. James J. Donnell was chosen to succeed Mr. John B. Jackson. In the absence of Mr. George Westinghouse, the president of the company, who is in Europe, Mr. H. G. Prout, the vice-president, presided. The financial report of the company, which has already been published in these columns, was not encouraging so far as the business done in 1908 was concerned, but the prospects for the future were said to be very satisfactory. It was announced that the company has at the present time on hand at Swissdale orders for unfilled business amounting to $1,357,000. New contracts for block signaling and other railroad safety devices are now coming in more freely than at any time during the last 12 months. Inquiries for quotations on new business are increasing right along and are spread pretty widely over the entire country.

CHICAGO & MILWAUKEE BONDS.—A petition was filed in the United States District Court of Milwaukee on March 12 by the receivers of the Chicago & Milwaukee Electric Railroad Company to determine the validity of a $2,000,000 bond issue. The receivers of the company are apparently of the opinion that the president exceeded his authority in this matter, and that the bonds were issued without consent of the Wisconsin State Commission. The bonds were issued before the railroad was placed in the receivers' hands, and other questions besides their validity are involved.

PURCHASE PACIFIC TELEPHONE BONDS.—J. P. Morgan & Company have purchased $15,000,000 of the collateral trust bonds of the Pacific Telephone & Telegraph Company. This company is one of the subsidiaries of the American Telephone & Telegraph Company. The proceeds of this bond sale will be mainly used for refunding purposes, but there will be enough retained to make all the improvements and extensions that are necessary. The bonds bear 5 per cent interest.

SUBWAY PLANS FOR ST. LOUIS.—Plans and estimates are nearing completion for a passenger and express subway from near the Eads Bridge downtown to Taylor Avenue, in the west end of St. Louis, the cost of which has been figured at nearly $40,000,000. Four branch lines are also planned. An organization has been effected. It is expected that New York capital will be secured to finance the enterprise.

GEORGIA RAILWAY & ELECTRIC COMPANY.—The report of the Georgia Railway & Electric Company for 1908 shows gross earnings of $3,339,021, an increase over the previous year of $29,680, or about 1 per cent. The net earnings were $1,689,027, an increase of $42,968, or about 2.6 per cent. After the payment of all fixed charges, 5 per cent dividends on the preferred and 6 per cent dividends on the common stock there remained surplus earnings for the year of $258,576. Beginning with April 1, 1908, the company operated under a new contract with the city of Atlanta. Under the new arrangement the charge for street lighting was reduced from $75 to $60 per arc lamp per year, and the rates for service to commercial customers was reduced from 12 to 10 cents per kw-hour for lighting and from 7 to 6 cents for power—both rates being the maximum permitted. During 1908 $390,786 was expended on new construction and additions, distributed as follows: Georgia Railway & Electric Company, $321,372; Atlanta Gas Light Company, $69,414. During the year 5.37 miles of new track were built, 4.07 miles rebuilt and .26 mile abandoned. The company controls the street railway, electric light, gas, power and steam heating interests of Atlanta and its neighborhood, and operates under a perpetual franchise. The stock of the company is largely owned by Boston interests.

PHELPS-DODGE COMPANY.—The capital stock of the Phelps-Dodge Company, to the extent of $50,000,000, has been listed on the New York Stock Exchange. The company has been incorporated with an authorized capital of the amount indicated, but there has been issued so far only $44,959,660. The assets of the company consist of 199,516 shares of the Copper Queen Consolidated Mining Company, for which was paid $135 per share, or $26,934,660; 26,000 shares of the Montezuma Copper Mining Company, for which was paid $307 9/13 per share, or $8,000,000; 40,000 shares of the Detroit Copper Company, for which was paid $150 per share, or $6,000,000, and 5000 shares of the Stag Cañon Fuel Company, for which was paid $800 per share, or $4,000,000. The total output of these mines in 1908 was 115,871,304 lb. of copper, and the net profits were $5,345,162. The dividends paid by these companies in 1908 amounted to about 7¾ per cent on the Phelps-Dodge Company stock.

WESTERN UNION TELEGRAPH COMPANY.—President R. C. Clowry, of the Western Union Telegraph Company, has submitted a report to the directors which shows that the net earnings of the company for the first quarter of 1909—the receipts for the month of March being estimated—will amount to about 1¼ per cent on the capital stock. The directors have declared a dividend of three-fourths of one per cent for the quarter. The actual figures given out estimate the total net revenue for the quarter at $1,700,000, which is an increase of $369,114 over the same period a year ago. The total surplus for the quarter is figured at $519,777, which makes the present surplus of the company $16,597,682. President Clowry says that the business outlook for the company is improving; that the property is being maintained in good condition and that additional facilities are being provided.

GOOD GAINS IN TELEPHONE EARNINGS.—From all parts of the country come reports of excellent gains in the earnings of telephone companies. The business of these concerns seems to have been less affected by the general depression than any other. The annual report of the Western Telephone & Telegraph Company, which is owned by the American Telephone & Telegraph Company, shows an increase in earnings of $598,500 over the previous year, and a balance applicable to dividends of $2,060,200, a gain of $168,500. The number of exchanges operated by the subsidiary companies was 413, and the stations operated through these exchanges numbered 277,227, an increase of 15,265 during the year. An increase of $373,900 was made in the amount paid out in dividends, the total sum disbursed to stockholders during the year being $1,899,200.

TWIN CITY RAPID TRANSIT COMPANY.—The report of the Twin City Rapid Transit Company, of Minneapolis, for 1908, is entirely satisfactory. The net earnings of the company were $3,233,554, which was an increase of $158,147, or about 5.1 per cent over the previous year. In spite of the general business depression, the company devoted large sums to maintenance and improvements. During the year $1,070,475 was expended upon the care of roadbed and for new cars. In addition to this, the company spent $1,643,000 for additions and extensions. To meet this expense, consolidated mortgage bonds were sold. The balance sheet of the company shows total assets of $42,761,175.

DENVER CITY TRAMWAY COMPANY.—The proposed reorganization plan of the Denver City Tramway Company has been approved by the stockholders. This plan involves a new issue of $25,000,000, 25-year 5 per cent bonds, which will be issued up to 85 per cent of the amount expended for improvements and extensions. It is reported that the directors contemplate calling for redemption, at 105, on Nov. 1, the $6,000,000 of outstanding bonds of the Denver & Northwestern Railway, which comprises the suburban system of the Tramway Company. The directors expect to have $5,000,000 immediately available for the improvement work.

LOUISVILLE RAILWAY COMPANY.—The sale of $1,000,000 4 per cent bonds has been authorized by the directors of the Louisville (Ky.) Railway Company. The proceeds of these bonds will go to meet the expenses growing out of the purchase of the Louisville & Eastern Railway Company. The latter property will come into the possession of the Louisville Railway Company within the next few months. The Louisville & Eastern is a suburban line running from Louisville to La Grange, 27 miles, with a branch 23 miles long under construction to Shelbyville, Ky.

UNITED ELECTRIC SECURITIES COMPANY.—The semi-annual statement of the United Electric Securities Company, of Boston, shows a surplus Feb. 1, 1909, of $1,265,062, compared with $1,256,677 on Aug. 1, 1908.

REPORTS OF EARNINGS.

	Gross earnings.	Expenses.	Net earnings.	Charges.	Surplus.
American Gas & Electric Company:					
January, 1909	$229,211	$157,318	$76,684	$26,175	$50,509
January, 1908	190,465	142,008	52,702	26,175	26,527
Brooklyn Union Gas Company:					
Year 1908	7,977,898	4,863,407	3,144,486	966,269	1,825,091
Year 1907	7,380,804	4,677,844	2,702,959	973,081	1,455,657
Denver Gas & Electric Company:					
Year ended Jan. 31, 1909	2,187,128	1,252,254	934,873	383,824	551,049
Year ended Jan. 31, 1908	1,987,864	1,185,007	802,857	375,716	427,141
Ft. Wayne (Ind.) & Wabash Valley Traction Company:					
January, 1909	109,673	64,272	45,401	.....	.....
January, 1908	103,019	57,496	45,523	.....	.....
Kansas City Railway & Light Company:					
January, 1909	534,527	315,497	219,030	152,801	66,228
January, 1908	496,321	258,831	237,490	151,278	86,212
Lincoln (Neb.) Gas & Electric Company:					
Year 1908	363,774	234,539	129,234	64,265	64,968
Year 1907	353,174	241,121	112,052	62,053	49,999
St. Joseph (Mo.) Railway, Light & Power Company:					
February, 1909	73,250	38,665	34,585	.....	.....
February, 1908	66,813	36,064	30,749	.....	.....
Twin City Rapid Transit Company, Minneapolis, Minn.:					
Year 1909	6,399,509	3,166,055	3,233,454	1,359,363	1,874,091
Year 1908	6,055,742	2,980,435	3,075,307	1,223,170	1,852,137
West India Electric Company, Jamaica:					
Year 1908	217,410	92,040	125,370	49,044	76,326
Year 1907	198,845	94,805	104,040	46,953	57,087
Western Telephone & Telegraph Company:					
Year ended Jan. 31, 1909	2,225,166	1,395,756	829,409	800,000	29,409
Year ended Jan. 31, 1908	2,124,414	1,316,551	807,862	800,000	7,862
Western Union Telegraph Company:					
Quarter ended Dec. 31, 1908	.....	.....	1,930,064	433,063	1,497,002
Quarter ended Dec. 31, 1907	.....	.....	803,942	433,062	370,880
Wilkes-Barre Gas & Electric Company:					
Year 1908	396,301	206,785	189,516	118,678	70,838
Year 1907	361,349	188,029	173,320	111,789	61,531

GENERAL NEWS

Construction News.

BREWTON, ALA.—The Council has decided to call an election to vote on the proposition to issue bonds, the proceeds to be used for the installation of a new and larger generator and engine in the municipal electric light plant.

RUSSELLVILLE, ALA.—The Russellville Manufacturing & Development Company has purchased the plant of the Russellville Ice & Cocoa Bottling Company and proposes to install an electric light plant to furnish electricity for commercial and public lighting.

GLOBE, ARIZ.—George W. P. Hunt has been granted a franchise by the City Council to construct and operate a street railway system in Globe.

PHOENIX, ARIZ.—The Old Dominion Copper Company, at Globe, has decided not to wait for power from the Roosevelt Dam, but is preparing to install a 2000-kw plant at Globe. M. Le Grand, electrical engineer, is preparing plans for the plant.

BAKERSFIELD, CAL.—Another large electric power plant is projected on the Kern River near Bakersfield, Cal. It will be located between the mouth of the canyon and the Kern River oil fields, and the power will be used to operate pumping plants on the arid plains of Kern County. The capitalists back of the project, with whom are associated John McWilliams and Henry J. Martens, have already purchased about 8,000 acres of land lying along the two banks of the river and including the river bed, which will give the new owners control of the river, with necessary right of way for a canal from a short distance below the Power, Transit & Light Company's power plant nearly to the north end of the oil fields. Mr. Martens says that no work will be begun on this enterprise before next fall.

CHICO, CAL.—Bids will be received by the Board of Trustees for a franchise to erect transmission lines for the distribution of electricity in Chico for a period of 50 years. Frank C. Wilson, representing the Sierra Power Company, has applied for such a franchise.

GLENDALE, CAL.—Preliminary plans have been made by Frank Campbell, L. C. Brand, J. F. McIntyre and D. Griswold, of Glendale, to organize a company which will furnish both electricity and gas. The company will be capitalized at $150,000.

GRASS VALLEY, CAL.—A preliminary survey is being made by Chief Engineer Trow for a large power project, which is believed to be directly connected with the California Midland Railroad. Surveys are being made for the construction of a 12-mile ditch to carry water to a point on the Yuba River, adjoining Sicard Flat, near Smartsville, where it will have a drop of over 400 ft. The power will be utilized to generate electricity to operate the railway.

HORNBROOK, CAL.—Arrangements are being made by the Siskiyou Electric Light & Power Company for the construction of its transmission line from near Snowden to Mines on the Klamath River below Hornbrook. The company will also erect another transmission line through the Little Shasta Valley from Sisson to Dunsmuir.

LINDSAY, CAL.—Harry A. Williams has purchased property located about 2½ miles south of Lindsay, and proposes to sink a well and install an electric pumping plant.

MONTAGUE, CAL.—It is reported that the Siskiyou Electric Light & Power Company will soon commence work on the construction of its proposed power plant on the Klamath River at Ward's Canyon. The plant will be capable of developing 64,000 hp and will require three years or more to build it.

OAKLAND, CAL.—The Great Western Power Company has awarded contracts to the Globe Construction Company, of San Francisco, for the construction of a power house on East Oakland Heights and a substation on Sessions Basins, at a cost of about $120,000. Contracts have already been awarded by the company for equipment and erection of transmission lines in connection with the work in this county, amounting to about $300,000.

SAN BERNARDINO, CAL.—The mining town of Hart is preparing to erect a telephone line to Barnwell to connect with the Western Union office at that station.

SAN DIEGO, CAL.—The City Council has granted a franchise to the Point Loma Railroad Company to construct and operate a street railway on certain streets in this city.

SAN FRANCISCO, CAL.—Frank L. Brown, president of the Brown-Walker-Simmons Company, and Walter Martin, president of the Eastern Oregon Land Company, are organizing a company for the purpose of promoting a power project in Eastern Oregon. While the plans have not been fully matured, it is understood that rights have been secured and that a plant for the development of electrical power will be constructed as soon as the financial preliminaries can be arranged.

SAN JOSE, CAL.—Bids will be received at the office of the supervising architect, Washington, D. C., until April 15 for lamp standards, etc., for the United States post office at San Jose, Cal., in accordance with plans and specifications, copies of which may be obtained at the above office or at the office of the custodian, at San Jose, Cal. James Knox Taylor is supervising architect.

SIERRA MADRE, CAL.—The city will issue bonds to the amount of $80,000, the proceeds to be used for the construction of a municipal electric light plant.

BOULDER, COL.—At the April election the proposition to issue bonds to the amount of $40,000 for the construction of a municipal electric light plant will be submitted to the voters.

COLORADO SPRINGS, COL.—The City Council has granted the Colorado Springs & Interurban Railway Company franchises to extend its railway lines to the Printers' Home, and the new Town and Gown Golf Clut grounds.

DENVER, COL.—The town of Inglewood, a suburb of Denver, has awarded contract to the Consolidated Engineering Company, of Denver, for the installation of a water-works system. The pumping plant will include two units, the first consisting of a triplex pump, connected to a 3-phase, 440-volt, 60-cycle motor; the second a horizontal centrifugal pump direct connected to a motor similar to that of the triplex pump. The pumps will have a capacity of 250 gal. per minute and will be automatically controlled by Sundh Electric Company's regulators.

MYSTIC, CONN.—The Mystic fire district has voted to instruct the executive committee to enter into a contract with the Mystic Power Company for street lighting for a term of 10 years. Under the terms of the contract the company is to furnish arc lamps at the rate of $68 per lamp per year and 20-cp incandescent lamps at $15 each per year.

NEW BRITAIN, CONN.—The City Council has authorized the Board of Public Works to enter into a new contract with the Connecticut Company for a period of three years, with the privilege of extending it to five years, at $85 per lamp per year, which is the same rate the city is now paying.

WINDSOR, CONN.—At a recent meeting of the Business Men's Association it was decided to request the Hartford Electric Light Company to extend its service to Rainbow and Haydens station to furnish electric lamps to the outskirts of the town.

WASHINGTON, D. C.—Proposals will be received at the office of the disbursing clerk, United States Department of Agriculture, Washington, D. C., until March 26 for furnishing and installing an electric generating unit and mechanical stokers. Specifications and full information will be furnished on application to the disbursing clerk. James Wilson is secretary.

ATLANTA, GA.—The County Commissioners have granted the Georgia Railway & Electric Company permission to extend its railway from its present terminus at Longley Street to the Inman yards, a distance of 1½ miles.

ATLANTA, GA.—The Atlanta Northeastern Railroad Company has applied to the Commissioners of Fulton County for a franchise to construct an electric railway on certain streets in Atlanta. The company proposes to construct an electric railway from Atlanta to Cummings, Ga., through Roswell and Alpharetta. J. L. Murphy is secretary.

MACON, GA.—Application has been made to the Town Council by the Central Georgia Power Company for a franchise to construct transmission lines in and through the town for transmission of electricity, to be generated at its plant located near Jackson, Ga.

WASHINGTON, GA.—Plans are being considered by C. S. Lucas for the construction of a hydro-electric plant about 10 miles from Washington. Mr. Lucas would like to communicate with engineers and manufacturers of machinery and equipment.

DANVILLE, ILL.—The Paris & Northern Interurban Railway Company is said to be making surveys for its proposed electric railway between Paris and Ridgefarm, a distance of about 26 miles. W. M. Bridgett is president.

EAST ST. LOUIS, ILL.—Application has been made to the City Council by the East St. Louis, Columbia & Waterloo Electric Railway Company for a franchise to construct an electric railway on Nineteenth Street from the southern limits of the city to Bond Avenue. E. F. Schoening, of Waterloo, is president.

EUREKA, ILL.—W. J. Whetzel, owner of the Eureka electric light plant, is negotiating with Samuel Ramsey, owner of the local electric plant, with a view of obtaining control of the distributing system in this village. If the deal goes through Mr. Whetzel proposes to enlarge the plant at Eureka and supply electricity in the towns of Eureka and Metamora and to farmers along its transmission lines between the two towns for lamps and motors.

FARMINGTON, ILL.—The Peoria & Galesburg Electric Railway Company has petitioned the City Council for a franchise to construct and operate an electric railway in Farmington.

NASHVILLE, ILL.—The Cairo & St. Louis Railroad, a branch of the McKinley system of interurban railways, has filed a mortgage for $250,000 in this city in favor of the Portland Trust Company, of Portland, Maine, to secure a bond issue of the same amount. The proceeds will be used for

improvements, which will include the construction of an interurban railway from East St. Louis to Cairo. The company recently purchased the Cairo street railway system, operating between Cairo and Mounds.

OREGON, ILL.—The Oregon Electric Light & Power Company has changed its name to the Oregon Power Company and increased its capital stock from $50,000 to $150,000.

QUINCY, ILL.—Contracts have been placed by the Quincy Horse Railway & Carrying Company for a 800-kw, direct-current, 500-volt generator.

ROCK ISLAND, ILL.—The Galesburg & Rock Island Traction Company has petitioned the City Council for a franchise to construct an electric railway on Fifth Avenue to Rock River.

ROCK ISLAND, ILL.—The City Council has awarded the contract for street lighting to the People's Power Company for a term of five years. The company is to furnish arc lamps at the rate of $60 each per year for street arc lamp and $33 each for alley lamps, which is a reduction of $5 each per year on the street lamps and $3 on the alley lamps.

STREATOR, ILL.—The Streator Clay Co. will expend $50,000 in erecting a new plant in the place of the one recently burned. The plant will need all new machinery.

DECATUR, IND.—The City Council has granted the Fort Wayne & Springfield Railway Company a franchise to construct and operate its railway in and through this city.

EVANSVILLE, IND.—Surveys have been completed for the proposed Evansville, Mt. Carmel & Onley Electric Railway, which will connect Evansville, Mt. Carmel, Onley and intervening towns. The railway will be 64½ miles in length.

INDIANAPOLIS, IND.—The Indianapolis Light & Heat Company has submitted a proposition to the Board of Park Commissioners offering to give the Park Board two strips of land along the north bank of Fall Creek in return for the permission to construct a dam across Fall Creek, near the Northwestern Avenue bridge. The company is to build the dam, which when completed becomes the property of the city, the company assuming the maintenance. The company requires the water for use of its condensers in its power plant.

JASONVILLE, IND.—The Farmers' Telephone Company, of Howesville, has applied to the City Council for a franchise to install a telephone system in this city.

LA PORTE, IND.—The Indiana Union Traction Company has filed a petition with the County Commissioners of La Porte, Starke, Pulaski and Cass counties for a franchise to construct an electric interurban railway through the counties to connect Logansport, Winamac, Bass Lake, Knox, La Porte and intermediate towns.

MONTICELLO, IND.—A company has been formed by William Thorn and others to construct a hydro-electric plant on the Tippecanoe River. The company will furnish electricity for lamps and motors.

PRINCETON, IND.—The Evansville & Southern Indiana Traction Company, it is reported, has decided to extend its railway from Paroka to Hazleton.

ROSEDALE, IND.—The Rosedale Telephone Company, recently incorporated, proposes to build and maintain a telephone exchange and system in Rosedale and Parke and Vigo Counties. Fred Wimmer, James A. Taylor and George W. Rukes are directors.

BLAIRSBURG, IA.—The Cedar View Telephone Company is planning to construct a telephone line to Webster City.

DES MOINES, IA.—C. R. Keyes, representing the Des Moines Elevated & Interurban Railroad Company, has applied to the City Council for a franchise to construct and operate an electric railway through certain streets in Des Moines.

CLAFLIN, KAN.—Plans are being made by E. R. Ruch to install an electric light plant to cost about $5,000. Clarence Sayre, of Claflin, is engineer.

FORT RILEY, KAN.—Bids will be received by Captain W. M. Whitman, constructing quartermaster, Fort Riley, until April 2, for extension to lighting system, including transformers, at this post. Plans and specifications will be furnished upon deposit of $5. Information furnished upon application.

LAWRENCE, KAN.—The plant and holdings of the Lawrence Electric Light Company have been purchased by Cyrus Mead, W. R. Sullivan and Victor Manuel, of Dayton, Ohio. It is said that the new owners contemplate the construction of a street-car system in Lawrence.

SABETHA, KAN.—Plans are being prepared by Burns & McDonnell, engineers, Scarritt Building, Kansas City, Mo., for the construction of an electric light plant and water-works system in Sabetha.

NEW ORLEANS, LA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 3 for furnishing and installing a 50-kw generating set and accessories at the naval station, New Orleans, La. Plans and specifications can be obtained on application to the bureau or the commandant of the naval station named. R. C. Holliday is chief of bureau.

LEWISTON, MAINE.—The Androscoggin Reservoir Company has applied to the Legislature for a charter with authority to construct and maintain a storage reservoir on the Magalloway River at Aziscohos Falls in Oxford County, and also to acquire the rights and powers of the Union Power Company, of Lewiston. Wallace H. White, of Lewiston, is interested in the project.

PRESQUE ISLE, MAINE.—It is reported that the Canadian Pacific Railway Company contemplates equipping its railroad to be operated by electricity from Aroostook Junction to Presque Isle.

SOLON, MAINE.—The town has voted to appropriate $500 to light the streets of the village by electricity during the coming year.

BROOKLINE, MASS.—A committee has been appointed to consider the question of establishing a municipal electric light plant. An appropriation of $51,000 has been proposed for street lighting for 11 months, until Jan. 1, 1910.

CAMBRIDGE, MASS.—Arrangements are being made by the Charles River Building Company for the construction of 22 eight-story warehouse and mercantile buildings on the Charles River in Cambridge. A central power plant with a rating of 5000 hp to furnish electricity for light, heat and power will be erected in connection with the project. Henry T. Anglim is president; Frederick J. Anglim, vice-president and secretary, and William J. Anglim, treasurer, all of Brockton, Mass.

CHICOPEE, MASS.—The Electric Light Commissioners are considering the question of installing new street lamps to replace the flaming arc lamp now in use. The new lamps will be furnished by the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa.

IPSWICH, MASS.—The report of the municipal electric light plant makes an excellent showing for the past year. The town appropriates $1,500 per year for the maintenance of 747 incandescent street lamps, which was what it cost the town under the old system, when the system included 20 gas lamps and 160 oil lamps. According to the report it cost the town $740 to light the streets; the cost including the entire appropriation, interest and depreciation is $3,790, making the cost $5.08 per lamp for the year. The committee suggests lighting the streets without any appropriation or reducing the rate for electricity from 12 to 10 cents per kw-hour to private consumers, beginning with July 1. George A. Schofield is manager.

NORTH ADAMS, MASS.—Plans are being considered for the addition to the Blackinton Mill, work on which will begin in the near future. The mill will be operated by electricity generated by water power. Arrangements will be made to connect the mill with the local electric company's system in case of emergency.

NORWELL, MASS.—The citizens are considering the question of lighting the streets by electricity.

OLDTOWN, MASS.—The citizens are endeavoring to have the streets of the town lighted by electricity, the service to be obtained from the municipal electric light plant at North Attleboro. The present plans call for the installation of 51 lamps at a cost of about $1,000, and a booster at the electric light plant to cost $600. William Plattner is superintendent of the electric plant at North Attleboro.

PITTSFIELD, MASS.—The Pittsfield Electric Company is planning to place its wires underground in the center of the city, which will involve an expenditure of about $10,000.

PLYMOUTH, MASS.—The Plymouth Electric Light Company has adopted a new schedule of rates for electricity for lamps to take effect from March as follows: For the first 100 kw, 18 cents per kw-hour; from 100 to 200 kw, 13 cents; from 200 to 300 kw, 11 cents, and for all above, 10 cents per kw-hour. A minimum charge of $1 per month will be made to all consumers.

STURGIS, MICH.—The City Council has adopted a resolution directing the Mayor and Clerk to take steps necessary to make application to the Board of Supervisors of St. Joseph County for permission to construct a dam across St. Joseph River for the purpose of developing 2000 hp, which will be utilized to generate electricity for lamps and motors.

WYANDOTTE, MICH.—Extensive improvements are contemplated to the system of the Michigan State Telephone Company in this city, which will involve an expenditure of about $40,000. A new switchboard will be installed and new instruments will replace the ones now in use.

DELANO, MINN.—The question of making improvements to the municipal electric light plant is under consideration.

DULUTH, MINN.—The City Council is considering the question of requiring that all telegraph, telephone and electric wires be placed underground on Superior Street, between Ninth and Twenty-fourth avenues East.

GILBERT, MINN.—The Virginia Light & Water Company has applied to the City Council for a franchise in Gilbert.

McKINLEY, MINN.—The question of lighting the town by electricity is under consideration.

PINE CITY, MINN.—The Pine City Electric Power Company will receive bids for the construction of its plant until April 10 (an extension of time from March 10). The company proposes to develop the water power of Snake River, about seven miles from Pine City, and erect transmission lines to Hinckley and Rush City. J. M. Allen is manager.

CHARLESTON, MISS.—We are informed that arrangements are being made to install an electric light plant in Charleston. The present plans contemplate the installation of tungsten street lamps, with the alternating-current, 1100-volt, 60-cycle system. Mayor Saunders or the Lamb-Fish Lumber Company would like to receive information in regard to the same.

MERIDIAN, MISS.—The City Council is considering the question of installing an electric light plant to be operated in connection with the water-works system.

CAPE GIRARDEAU, MO.—The Cape Girardeau-Jackson Interurban Railway Company is contemplating the purchase of a new switchboard.

KANSAS CITY, MO.—Bids will be received by the Board of Park Commissioners until March 22 for furnishing material and labor for electric wiring for the bird and carnivora house for the Zoological Garden in Swope Park, according to plans and specifications on file in the office of Sayler & Seddon, architects, Gumbel Building, Kansas City. Frank P. Gossard is secretary of Board of Park Commissioners.

BEATRICE, NEB.—It is reported that the bonds for $10,000 issued for an electric light plant have been declared illegal.

ELY, NEV.—It is reported that the control of the Giroux properties has changed hands and that the new owners are contemplating extensive improvements, which will include an addition to the power plant and the installation of a new pump. Joseph L. Giroux is president of the company.

CONWAY, N. H.—A proposition to utilize the water power of Odell Falls to generate electricity is now under consideration. Arrangements are being made to charter a company under the name of the Conway Electric Light & Power Company, with a capital stock of $50,000, to furnish electricity for lamps in Conway, as the present company does not give satisfactory service.

BUTLER, N. J.—The City Council has granted the Butler Gas Lighting & Heating Company a franchase to install an elecrtic light and power plant in Butler.

EDGEWATER, N. J.—The New Jersey & Hudson River Railway & Ferry Company has contracted with the General Electric Company, Schenectady, N. Y., for a 300-kw rotary converter with transformer and switchboard complete.

NEWARK, N. J.—The Public Service Corporation expects to purchase during the next three weeks miscellaneous apparatus for its various substations, including rotary converters, transformers and switchboard apparatus, and also one 2000-kw turbo-generator set for its Camden station.

SEABRIGHT, N. J.—Owing to a decision handed down by Judge Garrison, which prevents the Consolidated Gas Company of New Jersey from erecting its transmission lines along the wires of the Central Railroad Company of New Jersey, the gas company will discontinue its electrical service in Seabright after April 1.

TRENTON, N. J.—The bondholders' meeting of the Inter-State Railway Company has decided to purchase new equipment for the power station of the Trenton Street Railway Company at a cost of about $40,000. It is also proposed to purchase new cars to replace the cars now in use and make other improvements to the system.

AZTEC, N. M.—Preparations are being made by the Eden Canal & Power Company for the construction of an electric light plant.

NAMBE, N. M.—E. H. Fisher, of Cimarron, N. M., civil engineer, has been making surveys in Nambe, with a view of utilizing the falls of the Nambe in connection with an electric power plant.

PORTALES, N. M.—Plans have been completed for the construction of an electric light plant and water-works system in Portales, to cost about $50,000. Burns & McDonnell, Scarritt Building, Kansas City, Mo., are engineers.

ALBANY, N. Y.—Franklin B. Ware, state architect, has recommended to the Trustees of Public Buildings an appropriation by the State Legislature for the construction and equipment of a new power house and for construction of conduits and piping to connect the power house with the capitol and new State education building. Mr. Ware recommends the removal of the present power house to another site.

BATAVIA, N. Y.—The citizens on March 9 voted to appropriate $3,500 for a switchboard and a new generator for the municipal electric light plant.

CLIFTON PARK, N. Y.—The Dwass Electric Company has applied to the Public Service Commission, Second District, for permission to construct an electric light plant in the town of Clifton Park to furnish electricity for lamps in Clifton Park and on the grounds of the Round Lake Association; also in Round Lake and Ushers. The company also asked for authority to issue $20,000 in capital stock. A. T. G. Wemple, of Schenectady, N. Y., and Harold J. Werner, of Mechanicsville, N. Y., are interested in the company.

CLIFTON SPRINGS, N. Y.—At the coming election a proposition to issue $8,000 in bonds, the proceeds to be used for enlarging the municipal electric light plant, will be submitted to the voters.

LESTERSHIRE, N. Y.—A committee, consisting of B. W. Livingston and W. H. Birdsall, has been appointed to make investigations in regard to the cost of establishing and maintaining a municipal electric light plant.

LEWISTON, N. Y.—The Village Board is considering the question of lighting the town by electricity. Propositions for furnishing electricity in Lewiston have been submitted by the Ontario Power Company and the Porter Fiber Company.

NEW YORK, N. Y.—The Coney Island & Brooklyn Railroad Company has applied to the Board of Estimate and Apportionment for permission to lay tracks through the Flatbush Avenue extension to the Manhattan Bridge, now under construction, and over which it proposes to operate its cars.

NUNDA, N. Y.—The Board of Village Trustees has granted the Tuscarora Telephone Company a franchise to erect a telephone system in this town.

PORT LEYDEN, N. Y.—The application of George K. Seymour to transfer to Homer E. Wilson and George W. Post, of Port Leyden, his electric light plant in this town has been granted by the Public Service Commission, Second District. The Commission also granted Messrs. Wilson and Post permission to exercise the franchise granted to Mr. Seymour.

RENSSELAER, N. Y.—The Public Service Commission, Second District, has granted the Rensselaer Falls Electric Light & Power Company permission to construct and operate an electric light plant in Rensselaer Falls.

SCHENECTADY, N. Y.—The Schenectady Railway Company contemplates the construction of a substation at the north end of Ballston Lake on its Saratoga division, which will be equipped with two 600-kw rotary converters and two 300-kw rotary converters. The station when completed will supersede the one now in use at Ballston Lake. The new station will be connected with the Round Lake substation of the Hudson Valley Company, which is operated from the steam plant of the Delaware & Hudson Company at Mechanicsville. At present the Saratoga division secures electricity from the Hudson River Power Transmission Company's plant at Spier Falls. E. F. Peck is general manager.

WATERTOWN, N. Y.—The Public Service Commission, Second District, has authorized the consolidation of the Watertown Light & Power Company and the Watertown Gas Light Company. The commission has denied a previous application of the companies.

HIGH POINT, N. C.—The Legislature has passed the bill permitting the Piedmont Railway Company to amend its charter, allowing the company to operate between High Point and other towns.

SELMA, N. C.—The State Legislature has passed the bill authorizing this town to issue bonds for improvements, including a street lighting system and plant.

WAKE FOREST, N. C.—An election will be held April 12 to vote on the proposition to issue $15,000 in bonds, the proceeds to be used for the construction of an electric light plant.

HENSLER, N. D.—Wilcox Brothers are planning to construct a telephone line to Sanger, Center, Hensler, Deapolis and Stanton.

MANDAN, N. D.—We are informed that the Mandan Electric Company contemplates remodeling and enlarging its plant, but as yet no definite plans have been made except the purchase of two boilers. It is proposed to change the system from single to three-phase. B. K. Skeels is purchasing agent.

NORTON, N. D.—The Norton Farmer's Telephone Company has changed its name to the Norton Telephone Company and increased its capital stock from $10,000 to $30,000.

PINGREE, N. D.—A company is being organized to erect a telephone line to Deer Lake.

WASHBURN, N. D.—The Washburn Telephone Company contemplates the construction of about 50 miles of rural telephone lines.

BAINBRIDGE, OHIO.—It is understood that the Creek Power, Light & Heat Company is planning to construct a hydro-electric plant at Bainbridge, about three miles west on Paint and Rocky Ford creeks. Arthur Beisler, of Dayton, Ohio, is engineer.

CINCINNATI, OHIO.—L. P. Hazen & Company contemplate the construction of a combined power house and storage warehouse, work on which will begin in the near future, at a cost of $125,000.

CLEVELAND, OHIO.—Owing to the failure of the lighting companies to bid on the contract for lighting the county court house, the County Commissioners have decided to take steps to install a lighting plant in the court house. Additional improvements will be made when the new court house is completed. Only one bid was received, which was submitted by the Cleveland Light & Power Company.

COLUMBUS, OHIO.—The City Council has passed the ordinance authorizing the purchase of a generator for the municipal electric light plant at a cost of $45,000. When the new equipment is installed the plant will furnish electricity for lighting the city prison, workhouse, city hall, two public libraries, Central and North markets, and the High and Broad Street arches, and also at the garbage disposal plant when built. Plans are also being considered to operate the sewage disposal plant by electricity. The public buildings and High Street arches are now being lighted by a local company at a cost of about $8,000 annually.

SPRINGFIELD, OHIO.—Plans are being prepared by the Springfield Light, Heat & Power Company for the construction of the large addition to its plant on West Jefferson Street. The company proposes to extend its transmission lines for both lighting and power service and also to extend the heating system.

WOOSTER, OHIO.—The Wooster Brush Works has awarded a contract for the construction of a new factory building and also for a heating and power plant.

PRAGUE, OKLA.—Bids will be received until March 23 by F. M. Newhouse, town clerk, for furnishing material for the construction of an electric light plant and water-works system, as follows: Tower and tank, pressure pumps and accessories; motor-driven deep-well pumps, including motors; boilers, automatic steam engine, alternating-current generator, switchboard, arc lamps and regulator, transmission line equipment, etc. The Michael Cooke Engineering & Construction Company, of Joplin, Mo., has charge of the construction of the plant.

SENTINEL, OKLA.—Jennings, Barrett & Company have been granted a franchise to construct an electric light and power plant. Frederick P. Jennings is engineer.

ASTORIA, ORE.—The City Council has granted a franchise to the Oregon Coast Railway Company to construct an electric railway on certain streets in this city. The company proposes to build a railway between Astoria and Seaside.

BEND, ORE.—J. W. Juston, of Portland, Ore., and Bend, are interested in an irrigation and colonization scheme, which includes the installation of a power plant.

EUGENE, ORE.—Notice of appropriation of 20,000 in. of water of Lake Creek has been filed by J. W. McArthur. The water will be utilized for power purposes.

PILOT ROCK, ORE.—It is reported that prominent citizens of this place and other capitalists in Oregon are contemplating the construction of an electric railway from Pilot Rock to Ukiah and later on to extend the railway into Grant County.

ST. HELENS, ORE.—The St. Helens Mill Company is planning to install an electric light plant, providing sufficient patronage is guaranteed to justify the investment. Marshall Quick is interested in the project.

UNION, ORE.—It is reported that an electrical engineer has been engaged to make investigation in regard to the municipal electric light plant, which the city proposes to install at a cost of from $18,000 to $20,000.

CARLISLE, PA.—The Cumberland Railway Company has been granted permission by the State to construct an electric railway from Middlesex to Newville, via Carlisle, and along the State road westward from Carlisle. W. E. Gladfelter is president of the company and J. A. Ring, secretary.

CLIFTON HEIGHTS, PA.—Negotiations have been closed by the Delaware County & Philadelphia Electric Railway for the purchase of the Terminal Railway Company's franchise between Fernwood and Sixty-ninth Street, which will give the first-named company a direct route from Lansdowne to the Sixty-ninth Street terminal. The Delaware County company is a subsidiary of the Interstate Street Railway Company.

JOHNSTOWN, PA.—The Dale Light, Heat & Power Company has awarded a contract to the Northern Electric Company, of Madison, Wis., for a generator for its power house in Johnstown for $4,100. Orders for other equipment have already been placed.

JOHNSTOWN, PA.—It is reported that negotiations have been nearly completed whereby Emmitt Green, of Pittsburgh, Pa., will purchase the stock of the Consumers' Gas Company, the Citizens' Light, Heat & Power Company and the Johnson Natural Gas Company, all of Johnstown. It is said that the companies will be consolidated in a new company, with a capital stock of $1,500,000.

LEWISBURG, PA.—Application has been made for a charter for the Lewisburg & Milton Railroad by Boyd A. Musser, J. C. H. Newcomer, C. M. Clements and others. The company proposes to construct an electric railway between Shamokin Dam and Lewisburg. The first link of the system will connect Sunbury and Lewisburg, and later extensions to Williamsport will be built.

PHOENIXVILLE, PA.—The Philadelphia Interurban Railway Company has been granted a franchise to operate an electric railway in this borough.

SHARON, PA.—The Stewart Iron Company contemplates making improvements to its plant, which will involve an expenditure of about $100,000, and will include a new steel traveling ore bridge, unloading machinery, etc. All machinery in the plant will be operated by electricity.

NARRAGANSETT PIER, R. I.—The Sea View Railroad Company is making arrangements to increase the output of its power house. A 400-kw Westinghouse-Parsons steam turbine will be installed.

SPARTANBURG, S. C.—The city has awarded the contract for street lighting to the Electric Power & Manufacturing Company for a term of 10 years. The company proposes to make improvements to its steam power plant, which will be used as an auxiliary plant. Additional arc lamps will also be installed.

NASHVILLE, TENN.—The City Council has appropriated $6,000 for the purchase of arc lamp equipment.

AUSTIN, TEX.—A bill has been introduced in the Legislature by Senator Hudspeth asking for an appropriation of $250,000 to establish an electric light and power plant and water system for the State buildings.

FORT WORTH, TEX.—Plans are being considered for improvements to the municipal electric light plant, which will involve an expenditure of $62,605. It is proposed to enlarge the plant to provide for increasing the street lighting system, which calls for the installation of 400 additional arc lamps. The question will be submitted to the vote of the people.

OGDEN, UTAH.—We are informed that L. B. Spencer, engineer, Ogden, is preparing plans for the construction of a power plant, the cost of which is estimated at $150,000.

OGDEN, UTAH.—Application has been made to the County Commissioners by Lyman Skeen, Joseph A. Taylor and J. M. Child for a franchise to construct a railway from the northern limits of Ogden to Plain City.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company has been granted a 50-year franchise by the County Commissioners to extend its railway from Murray to Sandy and Bingham Junction.

BRATTLEBORO, VT.—The Connecticut River Power Company has nearly completed its transmission line from the Hinsdale-Vernon dam to Brattleboro. The company contemplates erecting a transmission line up the Ashuelot Valley as far as Winchester, so as to furnish electricity in the towns of Hinsdale, Ashuelot and Winchester. The company has already closed a contract with the Estey Organ Company, at Esteyville, to furnish electricity to operate its factory.

LUNENBURG, VT.—The citizens have voted to authorize the Selectmen to enter into a contract with the Lunenburg Manufacturing Company to light the streets of the town for a term of five years.

BASIC CITY, VA.—The Council is considering the question of issuing $25,000 in bonds, the proceeds to be used for an electric light plant and other improvements.

BROOKNEAL, VA.—Plans are being considered to organize a company to construct a hydro-electric plant on Staunton River. E. R. Monroe is interested in the project.

CLARKSVILLE, VA.—The Southern Traction & Power Company, which proposes to construct hydro-electric plants on Dan and Staunton Rivers, several miles north of Clarkesville, is planning to develop 20,000 hp., which will be transmitted to Danville, Va.; Burlington, Graham and Haw River, N. C., and probably to Reidsville, N. C. Junius H. Harden, secretary of the Burgrahaw Traction Company, of Burlington, N. C., is interested in the project.

FREDERICKSBURG, VA.—It is reported that the Fredericksburg Electric Company will receive bids at once for the construction of an electric light plant. R. M. Van Dorn is engineer.

FREDERICKSBURG, VA.—The Potomac & Rappahannock Company has decided to complete its telephone line to Montross and also to build a new telephone line from Colonial Beach to Fredericksburg.

PORTSMOUTH, VA.—Bids will be received until April 13 by L. P. Slater, city clerk, for the purchase of an electric lighting franchise and contract to light the streets, public buildings and to furnish electricity for residences and commercial lighting; also for motors. Specifications for bids may be obtained on application to the city clerk.

GIG HARBOR, WASH.—The Inland Empire Telegraph & Telephone Company has applied for a franchise to erect telephone lines through Henderson, Wollochet and North Bay districts.

HOQUIAM, WASH.—E. C. Finch has applied to the City Council for a franchise to install an automatic telephone system in Hoquiam. If the franchise is granted it is said that he will erect a system at a cost of $200,000.

OLGA, WASH.—A franchise has been granted to Robert Moran to erect transmission lines along the highways of Orcas Island. It is said that Mr. Moran has completed arrangements for the installation of an electric light and water-works systems.

SEATTLE, WASH.—Contracts have been awarded for the Second Avenue cluster lamp system as follows: For construction of conduits, etc., to Charles F. McDonald, for $20,096; for generators, to Meacham & Babcock, for $8,641, and for iron poles, to the Olympic Foundry Company, for $3,955.

SUNNYSIDE, WASH.—Robert E. Strahorn has applied for a franchise to furnish electricity for lamps and motors in Sunnyside.

KAMLOOPS, B. C., CAN.—Arrangements are being made for improvements to the municipal electric light and pumping plant at a cost of about $10,000. H. K. Dutcher, Flack Building, Vancouvre, B. C., is consulting engineer.

VANCOUVER, B. C., CAN.—It is reported that the Canadian Industrial Company is preparing plans for the construction of a 5000-hp hydro-electric plant on Powell River in connection with the erection of a paper and pulp mill. Alfred Carmichael is hydraulic engineer.

BRANTFORD, ONT., CAN.—The construction of an electric railway from Delhi to Burford, for which an application for a charter will soon be made, is under consideration. Paul Huffman is interested in the project.

GRAVENHURST, ONT., CAN.—The citizens have voted to appropriate $15,000 to complete the construction of the hydro-electric power plant at South Falls.

HAMILTON, ONT., CAN.—Plans are being made for the proposed rearrangement of arc lamps, under the new contract beginning July 1, 1909. The new plans call for 730 lamps. The present system includes 242 electric arc lamps and 279 gas lamps. Under the new contract the gas lamps will be discarded.

LONDON, ONT., CAN.—E. I. Sifton, city electrical engineer, has submitted his report to the special power committee in regard to the city establishing a municipal electric light plant, and in which he advises the city to construct and equip its own plant rather than to purchase the plant of the London Electric Company. He estimates the cost of a distributing station at $235,000. The London Electric Company offers to sell its plant to the city for $506,000. The Council has decided to engage a consulting engineer to make further investigations in regard to the matter. If it is decided to install a municipal plant electricity will be purchased from the Hydro-Electric Power Commission. The plans call for the distribution of 5000 hp.

FRASERVILLE, QUE., CAN.—The citizens are considering the question of remodeling the municipal electric light plant, and propose to install two water wheels and dynamos, with a total rating of 450 kw, with switchboard. M. Deschines is secretary and treasurer.

SWIFT CURRENT, SASK., CAN.—The citizens have voted in favor of the bylaw granting F. Laidley a 10-year franchise to install an electric light and gas plant.

HAVANA, CUBA.—The Havana Electric Railway Company contemplates the purchase of additional generating equipment for its power house. F. Steinhart is general manager.

PARRAL, MEX.—Plans are being considered by the Mexican Northern Electric Company, of Canada, for the construction of an electric power plant on the Rio Conchas River, a short distance from Parral, at a cost of about $5,000,000. The initial equipment of the plant will provide for an output of 15,000 hp, which will be used for mining and irrigation purposes. The company may extend the transmission line as far as Chihuahua. G. F. Greenwood, of Montreal, Que., is president.

Company Elections.

COTTONWOOD, IDAHO.—At the annual meeting of the Cottonwood Water & Electric Light Company the following officers were re-elected as follows: J. W. Turner, president; W. M. Schiller, vice-president; A. L. Creelman, secretary, and B. F. Simon, treasurer.

FREDERICKSBURG, VA.—At the annual meeting of the Fredericksburg Power Company the following named officers were elected: W. G. Whitner, president; A. P. Rowe, vice-president, and Alvin T. Embrey, secretary and treasurer.

New Industrial Companies.

THE MARYLAND ENGINEERING & CONSTRUCTION COMPANY, of Baltimore, Md., has been chartered by John E. George, W. Irving Walker and Peter R. Foley.

THE AMERICAN ELECTRIC EQUIPMENT COMPANY, of Kansas City, Mo., has been incorporated, with a capital stock of $2,500, by William J. Schott, C. A. Pierson and C. Koch.

THE LISLE ENGINEERING COMPANY, of Chicago, Ill., has been incorporated, with a capital stock of $25,000, by R. W. Lisle, G. D. Whitefort and G. S. Burtis, all of Chicago, Ill.

THE INCANDESCENT LAMP COMPANY, of Kansas City, Mo., has filed articles of incorporation, with a capital stock of $5,000. The incorporators are M. E. Davis, M. F. Elroth and J. E. Trogion.

THE NEW YORK CONSTRUCTION COMPANY, of New York, N. Y., has been chartered, with a capital stock of $10,000, by Craig A. Ross, of Brentwood, N. Y.; Albert P. King, of Brooklyn, N. Y., and Irving J. Bush, of Newark, N. J.

THE CONNECTICUT MOTOR VEHICLE COMPANY, of New York, N. Y., has been chartered, with a capital stock of $50,000, to manufacture motors, engines, machinery, etc. C. M. Gilpin, H. A. Shuart, H. C. Murray, all of New York, N. Y.

THE AMERICAN CROSS-ARM COMPANY, of Chicago, Ill., has been incorporated to manufacture supplies for telephone and telegraph companies by Charles C. Case, Jr.; J. Walter Stead and John I. Liver. The company is capitalized at $150,000.

THE LA SALLE ENGINEERING COMPANY, of Chicago, Ill., has been chartered, with a capital stock of $900,000, by Albert H. Tyrrell, N. Reardon and M. B. McConigle. The company proposes to do a general contracting and engineering business.

THE NAPIER MOTOR COMPANY OF AMERICA has filed articles of incorporation at Portland, Maine. The company is capitalized at $1,000,000 and proposes to manufacture engines, motors, etc. H. B. Clarity is president, and W. S. Quinby, treasurer, both of Portland, Maine.

THE TURNER BAFFLE-WALL & BOILER COMPANY, of Brooklyn, N. Y., has been chartered, with a capital stock of $20,000, to manufacture baffle-wall, baffle-plates, boilers, etc., by Roy Murchie, Pliny S. Riggs, of New York, N. Y., and Richard A. Wright, of Brooklyn, N. Y.

THE ELECTRICAL SALES COMPANY, of Boston, Mass., has been chartered, with a capital stock of $25,000, to manufacture and sell all kinds of electrical machinery. F. A. Barbey, of Cambridge, Mass., is president, and E. E. Williams, of Springfield, Mass., treasurer.

THE INVESTORS' ENGINEERING COMPANY, of New York, N. Y., has been incorporated, with a capital stock of $100,000, for the purpose of promoting engineering and industrial enterprises. The incorporators are T. Starrett, J. Breuchaud, P. B. Windsor, of New York, N. Y.

THE MILLER STORAGE BATTERY COMPANY, of Toledo, Ohio, has been chartered by George J. Clarence, H. and F. J. Miller, A. B. Hanson and Thomas L. Gifford. The company is capitalized at $10,000, and proposes to manufacture storage batteries and electrical supplies.

THE WATER & SEWERAGE PURIFICATION COMPANY, of Paterson, N. J., has been incorporated, with a capital stock of $1,000,000, by Frederick Saxelby, of East Orange, N. J.; Josiah A. Ludlow and Alfred Gartner, of Paterson. The company proposes to enter into contracts for the purifying of water and sewage by electrical and chemical processes.

THE BARRY-MEEKER COMPANY, of East Orange, N. J., has been incorporated, with a capital stock of $125,000, by J. Darby, of Summit, N. J.; C. D. Meeker, of East Orange, N. J., and H. D. Meeker, of New York, N. Y. The company proposes to manufacture electrical apparatus.

THE EMERSON ENGINE COMPANY, of Alexandria, Va., has been incorporated, with a capital stock of $100,000, to manufacture engines and motors for automobiles and motor boats. The officers are: Victor L. Emerson, president; Harry E. Jenkins, vice-president, and A. E. Emerson, secretary and treasurer.

THE EXCEL MANUFACTURING COMPANY, of Boston, Mass., has been incorporated, with a capital stock of $25,000, to manufacture and deal in all kinds of machinery. The officers of the company are: Jerome J. Pratt, president; Wilhelm E. Lundguist, treasurer, and Frank J. Flanigan, clerk, all of Boston, Mass.

New Incorporations.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed for the California Electric Railways Company to construct a crosstown railway 2½ miles long in San Francisco. The company is capitalized at $10,000,000, and it is understood that the ultimate object of the company is to take over the properties of the Stanislaus Electric Power Company and the Tuolumne Water Power Company, both of which were recently placed in the hands of receivers.

SAN GABRIEL, CAL.—Articles of incorporation have been filed for the San Gabriel Telephone Company with a capital stock of $200,000 and the following named directors: H. F. Metcalf, Edgar O. Fawcett, of Pasadena, and H. V. Carter, of Los Angeles, Cal., and others.

VISALIA, CAL.—The Tulane Home Telephone & Telegraph Company has been incorporated, with a capital of $25,000, by E. W. Rice, of Berkeley; G. C. Harris, B. W. Chenoweth, Scott Hendricks and T. J. Franklin, of San Francisco.

GLENWOOD SPRINGS, COL.—Articles of incorporation have been filed for the Mutual Light, Heat & Power Company by H. J. Holmes, G. W. Parmer, Carl Hedrick and others to supply electricity for light, heat and power. The company has applied to the County Commissioners for a franchise to erect transmission lines on the county roads and will also apply to the City Council for a franchise to supply electricity for lamps in Glenwood Springs.

BRUNSWICK, GA.—The City & Suburban Railway Company has been formed and has applied for a charter for the purpose of constructing a street railway system in Brunswick and in any part of Glynn County.

JONESBORO, GA.—The Riverdale Telephone Company has been chartered, with a capital stock of $1,000, by G. M. Hine, of Clayton County, and B. S. Hine and R. T. Aderhood, of Fulton County.

OAKWOOD, GA.—The Gainesville & Oakwood Telephone Company has been organized, with the following officers: J. W. W. Simmons, president; J. N. Wallis, vice-president; H. W. Crankshaw, secretary, and L. I. Hughes, treasurer.

NAUVO, ILL.—The Nauvo Electric Light & Power Company has been incorporated, with a capital stock of $10,000, by J. A. Bortz, John Schmitz and others.

COMO (P. O. REDKEY), IND.—The Como Telephone Company has been incorporated, with a capital stock of $10,000. The company proposes to build and equip a telephone exchange and system in Como and throughout Jay, Adams, Blackford and Wells Counties. The incorporators are: S. E. Hudson, Sherman Biubaker, M. H. Spahr, J. L. Resur, A. E. Lally, D. W. Bell, J. H. Dull and George C. May.

LAWRENCE, IND.—The Grassy Creek Mutual Telephone Company has been incorporated to build and operate telephone lines in Marion and Hancock Counties. B. F. Whitesides, John C. Roab and J. B. Mithoefer are directors.

MICHIGANTOWN, IND.—The stockholders of the Michigantown Co-operative Telephone Company have voted to purchase material and equipment for the improvements and extension to its system. William Huffer is president.

MT. VERNON, IND.—Suit has been brought to test the validity of the alleged perpetual franchise of the Cumberland Telephone Company to do business in this city. The city has ordered the company to vacate the streets, which it refuses on the claim of having a perpetual franchise assigned to it by the American Telegraph & Telephone Company.

ROSSVILLE, IND.—The Rossville Light & Heat Company has been chartered, with a capital stock of $6,000, to erect a light and heating plant. The directors are: Joseph E. Silverthorn, James R. Crouse and Noah W. Clark.

MONTEZUMA, IA.—Articles of incorporation have been filed for the Montezuma Electric Light, Power & Heating Company by George W. Wiltse and others. The company is capitalized at $6,000.

UNION, IA.—The Union Electric Power Company has been incorporated with a capital stock of $10,000. H. C. Chapin is president and E. A. Hunt, secretary.

EST, KY.—The Est Telephone Company has been formed, with a capital stock of $2,000. Felix Coldron, of Est, is manager.

NEW LIBERTY, KY.—The Ragland Telephone Company has been chartered with a capital stock of $2,000. The officers of the company are: M. B. Tapp, of Woodville, Ky., president; W. H. Cunningham, of Woodville, vice-president; T. E. Martin, of Rosington, Ky., secretary and treasurer.

PORTLAND, MAINE.—Articles of incorporation have been filed for the Globe Light & Power Company. The company is capitalized at $500,000, and the officers are: A. G. McPherson, president; J. R. Parsons, treasurer, both of Portland, Maine.

DENTON, MD.—The Peninsula Light & Power Company has been incorporated with a capital stock of $50,000 by Albert G. Towers, Harvey L. Cooper, and Thomas F. Garey, of Baltimore, Md. The company has taken over the plant of the Citizens' Light & Fuel Company, which has been in operation here for several years, and the franchise and water power recently acquired by Mr. Garey, who has commenced the work of constructing a new power plant.

CHAPIN, MICH.—Articles of incorporation have been filed for the Farmers' Mutual Telephone Company. The company is capitalized at $10,000, and the directors are: H. L. Fox, C. W. Sutliff, A. McClelland, J. W. Cross, H. K. Gibson and J. F. Batchelor.

GALESBURG, MICH.—The Citizens' Home Telephone Company has been organized to install a telephone system in Galesburg. A committee has been appointed to take steps to organize the company. W. S. Lawrence is chairman and Sidney Morton, secretary.

NEW BALTIMORE, MICH.—The Anchorville Bay Telephone Company has been organized to construct a telephone line to connect New Baltimore, Anchorville and Fair Haven. H. J. Knopf is president; A. J. Christy, secretary, and J. M. La Bounty, treasurer.

NORTHVILLE, MICH.—Articles of incorporation have been filed for the Inter-County Telephone Company, with a capital stock of $5,000. The directors are: Clement C. Yerkes, Louis A. Babbitt, Robert C. Yerkes and Frank Thompson.

SPRINGVALE, MICH.—The Springvale Telephone Company has been incorporated, with a capital stock of $1,800.

AITKEN, MINN.—Articles of incorporation have been filed for the Aitken Telephone Company, with a capital stock of $24,000, by Herman Moork, F. M. Shook, of Aitkin; C. P. De Laittre and J. L. De Laittre, of Minneapolis, Minn.

BRUSHVALE, MINN.—The Brushvale Farmers' Telephone Company has been incorporated, with a capital stock of $10,000, by John Holecek, Henry Lordeman, August Zarling, S. Peterson and others, of Brushvale.

FAIRFAX, MINN.—The Russia-Fairfax Telephone Company has been organized to construct a telephone line. The officers are: B. Hinton, president; Seivert Qualbert, vice-president; O. Sanness, secretary, and E. Durdahl, treasurer.

PINE RIVER, MINN.—The Pine River Rural Telephone Company has filed articles of incorporation, with a capital stock of $10,000. Charles W. Ladu is secretary.

SAUK CENTER, MINN.—The original stockholders of the Drogar Telephone Company have reorganized and incorporated under the name of the Little Sauk Rural Telephone Company, with the following named officers: G. M. Deyo, president; Ralph C. Doty, secretary, and Alex Dryden, treasurer.

CHARLESTON, MISS.—Articles of incorporation have been filed for the Charleston Light & Power Company by R. V. McGrew, J. H. Caldwell, W. B. Burke, I. C. Pattison, C. E. Harris, all of Charleston. The company is capitalized at $10,000.

HELENA, MONT.—Articles of incorporation have been filed for the United Missouri River Power Company of New Jersey, with a capital stock of $1,250,000, by S. T. Hauser and others.

CORTLAND, NEB.—The Highland Telephone Company has been incorporated with a capital stock of $21,000. M. M. Stanley is president and T. W. Sargent, secretary.

EDDYVILLE, NEB.—The Eddyville Telephone Exchange Company has been chartered with a capital stock of $1,000, by P. G. Muchie, W. J. Lawson and others.

NASHUA, N. H.—Articles of incorporation have been filed for the Jaffrey & Troy Electric Light Company, with a capital stock of $25,000, by Edwin C. Shattuck, Walter L. Goodnow and Charles L. Rich, of Jaffrey; Robert L. Pond, Sr., and Robert L. Pond, Jr., of Boston, Mass.

BAYONNE, N. J.—The Bayonne Lumber & Manufacturing Company has been chartered, with a capital stock of $100,000, by James T. R. Proctor, James F. Burnett, Hugh C. Colville and others, of Bayonne, N. J. The company proposes to deal in lumber and do a general light and power business.

VINELAND, N. J.—The South Jersey Rural Telephone Company, of Landis Township, has been chartered, with a capital stock of $25,000, by F. Macomber, A. H. Wilson, C. Becker, E. L. Bolles, D. Mecgeorge, W. S. Claypoole, D. S. Edison, S. A. Downs, G. H. Putnam and C. N. Veale, all of Vineland.

HOPEWELL JUNCTION, N. Y.—The Hopewell Light, Heat & Power Company has been incorporated, with a capital stock of $50,000, to furnish electricity for lamps, motors and heat. The incorporators are: Charles J. McKeown, Sophy McKeown, of Hopewell Junction, and Philip Schantz, of Highland, N. Y.

PORT JEFFERSON, N. Y.—The North Shore Electric Light & Power Company has been incorporated, with a capital stock of $25,000, by Fred C. Griswold, Frank C. Dildine, Luther H. Chambers, George E. Darling, all of Port Jefferson.

WHALLONSBURGH, N. Y.—The Essex & Whallonsburgh Telephone Company has been incorporated, with a capital stock of $2,000, by C. W. Sherman, P. N. Stafford, W. O. Fisher, of Whallonsburgh, and others.

THOMASVILLE, N. C.—The Piedmont Railway Company has been organized to take over the Carolina Valley Railroad to Dento and proposes to extend it to the timber region. The company is capitalized at $500,000 and the officers are: Milton L. Jones, of Thomasville, president; Thomas J. Jerome, of Salisbury, N. C., vice-president, and J. L. Armfield, secretary and treasurer.

WALES, N. D.—The Wales-Moscow Co-operative Telephone Company has been organized, with a capital stock of $3,000, to construct telephone lines between Moscow and Wales. The officers are: Ole Oldmansen, president; George H. Johnston, vice-president; E. Hill, secretary, and C. P. Getchell, treasurer.

Personal.

MR. H. P. HILL, consulting engineer, has moved from 50 Church Street, New York, to larger quarters at 30 Church Street.

MR. H. B. THAYER, president of the Western Electric Company, has been elected vice-president of the American Telephone & Telegraph Company.

MR. WALTER D. SNOW, Publicity Engineer, Boston, Mass., has been elected a member of the corporation of the Massachusetts Institute of Technology.

PROF. J. B. WHITEHEAD, of Johns Hopkins University, is the writer of an article in *Popular Science Monthly* for March, on the subject of heavy electric traction.

MR. W. L. ABBOTT, chief operating engineer of the Commonwealth Edison Company, Chicago, has been re-elected president of the board of trustees of the University of Illinois.

MR. WILLIAM CARROLL, city electrician of Chicago, has received material recognition of his services from the City Council, which has increased his salary from $5,000 to $6,500 a year.

MR. HOWARD S. PHELPS, formerly in charge of the Denver office of the late Dr. F. A. C. Perrine, has been appointed superintendent of power for the Crystal River Marble Co., Marble, Col.

MR. V. R. LANSINGH, general manager of the Holophane Company, addressed the agents' meeting of the Commonwealth Edison Company, Chicago, on March 9. His subject was "Illumination."

MR. CHARLES P. TAFT, of Cincinnati, Ohio, who recently severed his connection with several corporations, has again entered the Columbus Gas & Electric Company, of Columbus, Ohio, as director.

MR. CECIL B. SMITH, C.E., Toronto, Ont., has been retained by the Calgary Power & Transmission Co., Calgary, Alta., in connection with the development of electrical power at Horseshoe Falls.

MR. T. H. McCAULEY, formerly manager of the Twin City Electric R. R. Co., at Port Arthur, Ont., has been appointed manager for the municipal street railway system being installed at Calgary, Alta.

PROF. WILLIAM C. PECKHAM, of Adelphi College, will deliver several lectures on electrical subjects at Lafayette Hall, The Bronx, under the auspices of the New York City Department of Education.

MR. CHARLES L. HARRINGTON is delivering a weekly course of lectures on electrical subjects under the auspices of the New York City Department of Education at the Harlem Branch of the Y. M. C. A.

MR. HENRY M. STEELE, who has for the past several years been with J. G. White & Company, New York City, as chief civil engineer, has, on account of ill health, resigned and removed with his family from New York to Asheville, N. C.

PROF. LOUIS A. HERDT, associate professor of electrical engineering at McGill University, Montreal, has been appointed to succeed Professor R. B. Owens as occupant of the chair of electrical engineering in the same university. Prof. Owens retires owing to continued ill-health.

MR. JOHN T. BOWEN, for seven years an electrical expert aid with the Bureau of Construction and Repair, Navy Department, has resigned from that position to engage in representing manufacturers and dealers of electrical and mechanical apparatus before the government departments in Washington.

MR. J. J. CAGNEY, general agent of the Montreal Light, Heat & Power Company, of Montreal, Que., Can., has resigned his position to accept the position of manager of a large hydro-electric plant, now under construction in Georgia. Mr. Cagney has been connected with the company for the past nine years.

MR. CHARLES E. CARTER has resigned as superintendent of the Madison Gas & Electric Company, Madison, Wis., and is now superintendent of distribution and electrical engineer for the Northern Colorado Power Company at Denver, Colo. This company operates in the northern part of Colorado and southern part of Wyoming.

MR. B. E. SUNNY, president of the Chicago Telephone Company and vice-president of the General Electric Company and of the American Telephone & Telegraph Company, and Mr. Charles G. Dawes, largely interested in public-utility enterprises, have been appointed members of a special commission to standardize the duties and compensation of the employees in all departments of the city of Chicago.

MR. GEORGE F. FENNO, for the last two years insurance engineer with the Middle States Inspection Bureau, has resigned in order to join the staff of the Geo. H. Gibson Company, advertising engineers, New York City. Mr. Fenno is a graduate of Sibley College, Cornell University, class of 1906, and for some time after leaving school was telephone engineer with the New York & New Jersey Telephone Company.

MR. HAROLD ALMERT, who, as noted in these columns, recently resigned his position as manager of the Wichita Gas, Electric Light & Power Company, Wichita, Kan., where he has been bringing about a remarkable development of that property within the past two years, has opened an office as consulting engineer at 704 Royal Insurance Building, Chicago, and will make a specialty of building up on central station properties.

MR. F. P. WOY has resigned as manager of the Twin State Gas & Electric Company, Brattleboro, Vt., and has opened an office in Madison, Wis., to conduct a general consulting and engineering business for electric railway, electric light and gas companies. Mr. Woy was with J. G. White & Co., New York, for a number of years, and has at various times been connected with the construction and operation of plants in different parts of the United States.

MR. J. G. BOYD, for many years associated with the Columbia Incandescent Lamp Company, of St. Louis, is now connected with the Central Electric Company, of Chicago, as manager of the lamp department. Mr. Boyd, known to his intimates as "Texas" Boyd, has had a valuable experience in the sale of incandescent lamps, and, as the Central Electric Company's lamp business has grown rapidly, Mr. Boyd's long experience and wide acquaintance make him particularly well qualified to take charge of the new department.

MR. G. A. McCARTHY has become associated with Smith, Kerry & Chace, engineers, Toronto, Ont. Mr. McCarthy is a graduate of McGill University and, besides having been engaged in various railroad work, was principal assistant engineer from 1901-1905 on the construction of the power development works of the Canadian Niagara Power Company. Mr. McCarthy's immediate duties will be to construct a 10,000-hp plant for furnishing hydro-electric power to the mines in the celebrated Cobalt district. The project for the construction of the proposed power plant was organized and financed by Messrs. Smith, Kerry & Chace.

MR. W. R. PATTERSON, who retired from the service of the Western Electric Company at the beginning of the year, after a connection with that company lasting 31 years, has formed a copartnership with Mr. F. E. Davidson, formerly constructing engineer of the Western Electric Company. The new firm is doing constructing and industrial engineering work, with an office in the Monadnock Building, Chicago. Mr. Patterson was plant engineer of the Western Electric Company for a number of years before he severed his connection with that company, and he is highly regarded by the large number of electrical men who enjoy his acquaintance.

Obituary.

MR. WILLIS J. RODMAN, acting superintendent of telephones and telegraphs of the Panama Railroad, died at Colon, Feb. 28, after a long illness. Mr. Rodman had been on the Isthmus since 1905, and for some months acted as train despatcher.

MAJOR E. L. A. ZALINSKI, U. S. A. (retired), died in New York, March 10, of pneumonia. As a youth, Major Zalinski saw service in the Civil War and received a commission as lieutenant for an act of gallantry in battle. At the close of the war he received a commission in the regular army, and in 1894 was retired for disability with the rank of major. Major Zalinski is best known for his work on the dynamite gun, but was also an authority in various branches of ordnance. In recent years he devoted much attention to the subject of illuminating engineering, to which he contributed several inventions.

Trade Publications.

WIRE.—The manufacture and uses of wire are well described in an artistically illustrated pamphlet isued by the John A. Roebling's Sons Co., Trenton, N. J.

TUNGSTEN FIXTURES made with detachable link chains are illustrated, listed and described in a folder issued by the F. Wakefield Brass Company, Vermillion, Ohio.

ALTERNATORS.—The Electric Machinery Company, Minneapolis, Minn., has issued a well-illustrated bulletin, designated as No. 105, devoted to revolving-field alternators.

HIGH-TENSION SPECIALTIES.—The Central Electric Company, Chicago, is distributing a circular descriptive of its new line of disconnecting switches, fuses, lightning arresters, etc.

ARC LAMPS.—The Warner Arc Lamp Company, Muncie, Ind., is distributing return post cards for drawing attention to its vertical type flaming arc lamps. These lamps use domestic electrodes.

ROPE DRIVES.—No. 8 of Vol. XXIV of "Power and Transmission," published by the Dodge Manufacturing Company, Mishawaha, Ind., contains a well-prepared description of rope drives. This publication will hereafter be known as "The Dodge Idea."

FRICTION CLUTCHES.—The Hill Clutch Company, Cleveland, Ohio, has reprinted for general distribution a paper by Prof. R. G. Dukes on "Tests of Friction Clutches for Power Transmission," which was read before the A. S. M. E. in December, 1908.

SECOND-HAND MACHINERY, including direct-current and alternating-current generators and motors, directly coupled generating sets and ventilating fans are described in a special price list issued by the Arthur Jones Company, Old Colony Building, Chicago.

PANEL BOARDS.—The March issue of "Trumbull Cheer," issued by the Trumbull Electric Manufacturing Company, Plainville, Conn., gives a list of regular panel boards carried in stock. A bulletin giving prices on these boards has also been issued by the company.

FANS.—Bulletin No. 1114 of the Fort Wayne Electric Works, Fort Wayne, Ind., is a well-arranged publication, illustrating, listing and describing fans driven by direct-current and alternating-current motors. The fans are of the desk bracket, ceiling and ventilating types .

CREOSOTING.—A technical discussion of the preservation of wood by the creosoting process is given in Catalogue F of the Wyckoff Pipe & Creosoting Company, 50 Church Street, New York. A considerable portion of the catalogue is devoted to conduits, cross-arms and poles.

X-RAY APPARATUS.—Complete X-ray outfits and accessories for laboratory use are discussed in part of Catalogue G of the Kny-Scheerer Company, 404 West Twenty-seventh Street, New York. Part 4 of the same catalogue deals with apparatus for galvanocautery, endoscopy and diaphanoscopy.

CONCRETE CHIMNEYS.—Much interesting information concerning reinforced concrete chimneys for industrial establishments is contained in a pamphlet issued by the Weber Company, 929 Marquette Building, Chicago. This company has issued a separate bulletin giving a list of Weber chimneys now in use.

TELEPHONE SERVICE.—The Western Electric Company has issued a booklet entitled "Satisfaction," which contains six excellent photographs of President Taft, showing him in the act of receiving the news of his election over the telephone. It also contains a number of well-known quotations from President Taft's writings.

THE MOORE TUBE LIGHT.—The Moore Electrical Company, 165 Malvern Street, Newark, has issued a booklet (No. 19) entitled "The Moore Light." The text treats specifically of the two colors, white and yellow, which have now become standardized. It also includes electrical data concerning standard lengths of tubes.

SECOND-HAND MACHINES.—The March "Bargain Sheet" of the Gregory Electric Company, Chicago, Ill., gives a complete price-list of alternators, direct-current motors and generators, single-phase and polyphase motors, arc lamps, incandescent lamps, watt-hour meters, switchboards, transformers and miscellaneous supplies.

STOKERS of the chain-grate type are thoroughly described and illustrated in detail in a neatly executed catalogue "G" of the Green Engineering Company, Commercial Bank Building, Chicago. The catalogue contains a valuable series of coal tables, showing the heating values and chemical compositions of the coals found in America.

ENGINES AND BOILERS.—A neatly printed catalogue dealing with slide valve and Corliss engines of the simple and compound types and boilers of the water-tube and fire-tube types has been issued by the Atlas Engine Works, Indianapolis, Ind. The catalogue contains a large amount of information for the steam engineer, arranged in convenient form for ready reference.

ELECTRIC WAGONS.—The Lansden Company, Newark, N. J., is distributing some instructive literature relating to electric vehicles. In addition to folders showing standard types of electric trucks, and question blanks for those desiring detailed information, the company has isued a pamphlet descriptive of its wagons and showing the advantages of electric over horse-drawn vehicles.

CALENDAR CARD.—"Fear Not to Sow" is the title of a neat combined calendar and blotter issued by the Geo. H. Gibson Company, advertising engineers, Tribune Building, New York City. The company advises manufacturers of engineering supplies and equipment to prepare the way for large sales during the resumption of busines by means of intelligently directed educational publicity.

NEW TYPE OF LUNDELL FAN.—The Lundell fan has been improved still further this season by the addition of an oscillator mechanism which can be adjusted to the 1909 type of the fan. This feature is fully described in a new catalog, No 320, just issued by the Sprague Electric Company, New York. The catalog also illustrates a full line of direct- and alternating-current fans for all locations.

SWITCH AND OUTLET BOXES of stamped steel are described and illustrated in the new catalog, No. 23, of the Chicago Fuse Wire & Manufacturing Company. They are of the "Union" type, for both rigid and flexible conduit, and an effort has been made to illustrate every standard cover, giving detailed dimensions. Where desired, boxes are furnished with a galvanized coating applied both inside and outside by the Sherardizing process.

PERFORATED METAL.—The Allis-Chalmers Company has issued Bulletin No. 1425, having for its subject "Perforated Metal." The illustrations represent various varieties of perforated plates, the exact size and style of the perforations being shown. Perforated metal is claimed to be superior to wire cloth, being much stronger, more uniform in size of hole or mesh and less liable to tear or rust out. Unlike wire cloth, it presents a perfectly smooth surface, allowing the material to pass it smoothly and quickly.

Business Notes.

THE AMERICAN AUTOMATIC SWITCH COMPANY has removed its offices to the Hudson Terminal Building, 50 Church Street, New York.

MR. WILLIAM MARTIN has joined the staff of the Kennedy Valve

Company, and will be manager of the New York City sales department, with offices at 57 Beekman Street.

THE BANNER ELECTRIC COMPANY, of Youngstown, Ohio, is reported to be preparing plans for a large addition to its plant. The company manufactures electric bulbs and other electrical supplies.

THE KENNEDY VALVE MANUFACTURING COMPANY, New York, announces that William Martin has joined the forces of the Kennedy Valve Manufacturing Company as manager of the New York City sales department, with offices at 57 Beekman Street.

AUTOMATIC SWITCH COMPANY.—A note in the issue of March 11 reported that the Automatic Switch Company had removed its offices to the Hudson Terminal Building. This was an error, as the offices of the Automatic Switch Company remain at 131 Liberty Street, where they have been located for fifteen years.

ISOLATED LIGHTING PLANT.—The Indiana Springs Company, Kramer, Ind., has placed with the Central Laboratory Supply Company, Lafayette, Ind., an order for a complete electric lighting plant, to consist of two generating units, a switchboard and a number of motors. The installation is being made under the direction of Prof. J. W. Esterline, consulting engineer.

THE CUTLER-HAMMER MANUFACTURING COMPANY has opened a district office in Cleveland, Ohio, in the Schofield Building. The new office will be in charge of Mr. C. J. Kruse, who comes from the engineering department of the Cutler-Hammer Company, and who is well qualified to advise regarding the proper device to use in any case involving the control of electric motors.

THE AMERICAN BATTERY COMPANY, of Chicago, will move from 172 South Clinton Street to 312-314 Fulton Street, corner of May Street, on May 1. In its new location the company will have a three-story-and-basement building, 50 by 100 ft. in ground dimensions, with much more space than is now available. Mr. George T. Burroughs is president of the American Battery Company.

THE MASSACHUSETTS CHEMICAL COMPANY is making further additions to its plant at Walpole, Mass., to accommodate the increase in the business of the molded rubber department. The use of molded rubber goods, particularly in the electrical line, has assumed large proportions. Bushings, pump valves, rubber mats, car steps, etc., also are some of the specialties of this department of the Massachusetts Chemical Company.

MR. THEODORE STAVE, president of the Stave Electrical Company, manufacturer of the Stave flaming arc lamp, has just returned from an extended trip throughout the West. He has visited the different branches and established several new ones. Mr. Stave reports that his company's business is increasing very rapidly and, in fact, is very enthusiastic about the business outlook generally throughout the West.

MR. A. EUGENE MICHEL, who as manager of a technical advertising organization has for the past few years been identified with the publicity of numerous large manufacturing concerns, has just opened new offices at 1572 Hudson Terminal Buildings, New York. Mr. Michel will in future confine his efforts as an advertising engineer to the promotion of steam specialties and appartus, power transmission appliances and machine tools and will limit his clientele to the number of firms to whose work he can give personal attention. Mr. Michel is a graduate engineer, Associate Member of the A. S. M. E., and, with 11 years' advertising and engineering training, which includes practical experience in machine design, testing, etc., is well prepared to conduct the advertising of mechanical products.

JOHNSTON ELECTRIC COMPANY.—Beginning March 10, the firm known as the Western Electrical Company, Omaha, will conduct its business under the name of the Johnston Electric Company. There will be no change in the business or the personnel of the company. The reason given by President Johnston for making the change in name is that the establishment of an Omaha branch by the Western Electric Company, of Chicago, caused much confusion, letters and orders for one company being often delivered to the other. While there is but little similarity in the business of the two concerns, the confusion of names caused many delays and annoyances to customers of the old Western Electrical Company, which the change in name will prevent. Mr. Johnston has conducted an electrical supply business in Omaha under the name of the Western Electrical Company for the last 20 years.

CROCKER-WHEELER SALES.—Among the orders booked the past week by the Crocker-Wheeler Company are the following: A 600-kw 250-volt direct-current generator for William Rahr & Sons Co., Manitowoc, Wis., and a 500-kw generator for the Shenango Furnace Company, Sharpsville, Pa. The Dallas Cracker & Biscuit Company, Dallas, Tex., has ordered a 75-kw, 240-volt alternator and switchboard and a number of induction motors, aggregating 33 hp, with which to operate its plant. Another similar order is from the Anderson Lumber Company, of Passaic, N. J., for a 125-kw generator and switchboard and 160 hp of induction motors. These motors are all of the squirrel cage type. A 225-hp wound rotor type induction motor has been ordered by the Youngstown Sheet & Tube Company for operating its wire mill at Struthers, O. Among the direct-current motor sales are one of a 100-hp shunt motor for the American Car & Foundry Company; an 85-hp motor to drive an air compressor for J. M. Kohler Sons Company, Sheboygan, Wis., and a 60-hp motor for the Bridgeport Brass Company's plating department, Bridgeport, Conn.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED MARCH 9, 1909.

[Conducted by William F. Bissing, Patent Law., 2 Rector Street, N. Y.]

914,375. ELECTROMAGNETIC CLUTCH; H. Ast, Vienna, Austria-Hungary. App. filed June 15, 1906. Avoids the danger of the lubricant getting to the winding of the magnet and between the contact surfaces, which would produce slipping; throws the lubricant outward by centrifugal force through suitable guiding surfaces and lubricant guide rings.

914,386. BLOCK SIGNALING SYSTEM; H. M. Coulter, Chicago, Ill. App. filed Aug. 2, 1907. Improvement on Patent No. 794,784, relating to locomotive cab signals. The cab signals are operated mechanically, instead of electrically, by means of a series of mechanical actuating devices which are arranged along the track to actuate the whistle or bell on the locomotive.

914,395. TELEPHONE DISINFECTOR; M. A. Dohney, Chicago, Ill. App. filed Aug. 21, 1908. A disinfectant receptacle having flexible arms which engage the telephone mouthpiece, the receptacle being secured to a cord so that it may be removed from the mouthpiece and remain suspended from the transmitter when the same is in use.

914,412. RAILROAD SIGNAL; Henry A. Hoeschen, Omaha, Neb. App. filed May 27, 1907. Operated by the vibration of the rail caused by the passage of the train. A pair of levers engage the rail, and the signal bell, controlled by an electromagnet, is actuated by the levers when the train depresses the rail.

914,435. ROTARY CIRCUIT-CLOSER; Frank E. Lind, Kent, Ohio. App. filed July 9, 1908. For internal combustion engines; reduces the friction on the contact members. The electrical contact is made by means of balls, in a tubular head, which are forced apart by a radial arm so as to provide an electrical contact.

914,445. ENGINEER'S ALARM; E. McClintock, St. Paul, Minn. App. filed Dec. 18, 1905. Provides means whereby the engineer of the following train is warned thus avoiding rear-end collisions; for double-track systems. The track is divided into blocks having normally closed circuits, short-circuited by the train, and means are provided whereby the caution and danger signal circuits on a second train are successively broken when the track circuit in the block ahead is interrupted by the passage of the preceding train.

914,461. ELECTRIC BLOCK SYSTEMS FOR RAILWAYS; C. H. Shaffer, Muskegon, Mich. App. filed April 1, 1907. For electric roads having a sectional trolley to enable the operator in the block house to signal the engineer on the car. A telephone is provided at the station and on the car, which can be switched into connection.

914,468. LOCK-OUT FOR PARTY LINE TELEPHONES; W. F. Wagner and W. E. Shields, Toledo, Ohio. App. filed Feb. 26, 1908. A lock-out device for party lines to automatically cut out all other telephones than the one in use, so as to prevent listening in or talking. Makes use of a primary circuit and a ground circuit, each having make and break contact parts, and a member which opens one circuit and closes the other, and is actuated by mechanical means and magnetic means to hold the member in position to close the ground circuit and open the primary circuit, the magnetic means being energized when another telephone in the line is in use.

914,482. RAILROAD AUTOMATIC DANGER AND SAFETY SIGNAL SYSTEM; A. F. Eells, Washington, D. C. App. filed Aug. 15, 1905. Gives an alarm on the car when the switch or draw is open; also provides means for telephoning between cars or cars and a station. Means are provided governed by the entry of a car upon a block for weakening the current in a signal circuit without interrupting it, and thereby actuating the signal.

914,483. DEVICE FOR PREVENTING COLLISIONS AT SEA; G. Erdman and G. Fischer, Berlin and Charlottenburg, Germany. App. filed Oct. 21, 1907. Automatically stops ships when they approach the danger zone by wireless apparatus which coacts with apparatus for stopping the engines of the ships. The radius of action is regulated by regulating the length of the sparks and the antenna.

914,489. ELECTRIC FURNACE; S. F. Hall, Worcester, Mass. App. filed June 1, 1908. An electric furnace with a smelting chamber in which heat is abstracted from the charge at the highest temperature by water cooling the interior and exterior walls of the furnace, at special points, thereby obtaining an equalized temperature.

914,499. ELECTRICITY RECTIFIER; T. J. Murphy, Rochester, N. Y. App. filed March 19, 1908. Changes alternating to direct current by utilizing an electric arc which provides a gap normally impassable to the current and permits the current to flow across the gap at definite points in its wave.

914,515. SWITCH; C. D. Rolfe and C. F. Fox, Redlands, Cal. App. filed Jan. 7, 1907. For the primary and secondary circuits in automobile lighting apparatus. Either lamp may be ignited individually, the lamps burning acetylene, and during the ignition of the other lamp is prevented. Makes use of a swinging arm to close a second circuit, which, on the further actuation thereof, presses against spring-actuated members to close the first circuit.

914,534. TIME-INDICATING DEVICE; S. P. Thrasher, Manchester, Conn. App. filed Sept. 4, 1906. Indicates the time by numerals which show through a suitable aperture. For use in telegraph and telephone offices. The invention particularly indicates parts of a minute other than seconds. See Patent No. 905,956. A disk carrying the desired parts of a minute is rotated in front of a suitable aperture so as to show the numeral when desired.

914,537. AUTOMATIC ELECTRIC IGNITER SWITCH; C. L. Vannort, Louisville, Ky. App. filed Dec. 21, 1905. An automatic switch for throwing in a battery circuit when the engine and dynamo slow

down, provided with an indicator, such as a signal lamp, to indicate when the dynamo is operating.

914,540. SPARK PLUG; Frank J. Watt, Detroit, Mich. App. filed Sept. 9, 1908. Has a tubular metal projection with a bushing of insulated material screw fitted therein, a metal bushing and a metal stem extending through the insulating bushing, the stem carrying a spring washer. Designed to avoid breakage from unequal expansion.

914,611. RAILWAY SIGNALING MEANS; T. W. Stanage, Porterville, Cal. App. filed July 13, 1908. Notifies the engineer when a second train enters the block by a suitable cab signal. A switch depressed by the wheels operates the signal within the cab.

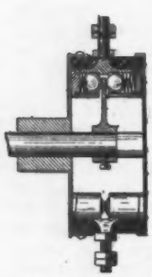
914,626. CONTACT MAKER FOR HELM INDICATORS; F. W. Wood, Newport News, Va. App. filed Dec. 19, 1907. Placed on the bridge or in the engine room to indicate the position of the helm. Multiplies the movement of the indicating arm by a second shaft geared to the shaft carrying the indicator.

914,646. STORAGE BATTERY; E. C. Ekstromer, Boston, Mass. App. filed June 3, 1907. For closing the battery casing and holding the wooden separators between the plates in position. Provides a plate having depending members arranged transversely to the wooden separators, and in contact therewith.

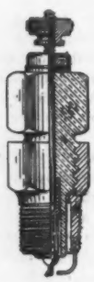
914,657. ELECTRIC ACCUMULATOR PLATE; C. F. Guyon and R. W. Vicarey, New York, N. Y. App. filed Oct. 30, 1908. Improvement on reissued Patent No. 12,195. The plate consists of alternate-corrugated and non-corrugated strips of lead.

914,677. SHUNT CONTACT FOR ELECTRIC SWITCHES; W. M. Scott, Philadelphia, Pa. App. filed March 26, 1907. For preventing arcing. Eliminates the intermediate metal or shunt contacts and employs a single shunt path whose contacts consist of a mixture of carbon and finely divided metal.

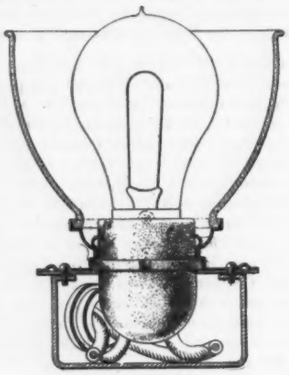
914,684. ARC LAMP; W. F. Warner, Muncie, Ind. App. filed June 25, 1906. Regulates the lamp independent of the strength of current



914,435—Rotary circuit closer.



914,540—Spark plug.



914,762—Conduit receptacle.

by providing special means for operating the clutch to restrike the arc at predetermined intervals, irrespective of the consumption of the electrodes.

914,690. TELEPHONE SYSTEM; F. W. Wood, New York, N. Y. App. filed July 6, 1906. Relates to a combination of a plurality of telephone sets, each having a receiver and transmitter, a clearing out drop, a source of electrical energy and means for connecting the receiver of one set and the transmitter of another in series in one branch circuit, the source and drop in another branch circuit and the other transmitter and receiver in series in a third branch circuit, the branch circuits being connected in multiple across the branch containing the source and drop.

914,713. MULTIPLEX TELEGRAPH SYSTEM; T. Giara, Boston, Mass. App. filed July 28, 1905. Particularly for wireless telegraphy by means of which some of the impulses are sent over a conductor to one station and others through the air to another station. Uses several harmonic currents, whose impulses are sent simultaneously and received separately.

914,715. REGISTERING MECHANISM FOR TELEPHONES; V. D. Grene and K. W. Fort, Chicago, Ill. App. filed Sept. 9, 1907. Records outgoing calls by a device actuated by the telephone. Does not make use of electrical connection for operating the register. The register includes register disks with mechanism controllably connected with the call-effecting device whereby the circuits of the telephone are affected on the operating of the call-effecting device, together with means for operating the disks and releasing the circuit-affecting mechanism from the call-effecting device and restoring the circuits.

914,719. TROLLEY BASE; J. A. Hanson, Detroit, Mich. App. filed March 9, 1908. Utilizes the maximum power of the springs to lift the pole by providing an auxiliary arm and a sliding connection between the arm and the trolley arm, the auxiliary arm being actuated by a spring.

914,762. CONDUIT RECEPTACLE; James S. Stewart, New York, N. Y. App. filed March 7, 1908. An outlet box having a perforated cover plate, and a body having a vitreous housing passing through the cover plate and secured to the plate by screws. Leaves a large amount of space within the box for making connections.

914,772. PORTABLE ELECTRIC LIGHT FIXTURE; L. A. Williamson, Providence, R. I. App. filed May 29, 1908. For use in hotel rooms, etc. The light is portable and can be carried in a traveling bag and the flexible cord reels up on a spring drum within a case on which the lamp is mounted.

914,801. AUTOMATIC ELECTRICAL SIGNALING SYSTEM FOR RAILWAYS; C. Crandall, Springfield, Mass. App. filed Oct. 12, 1907. Renewed Sept. 2, 1908. Gives a signal in the locomotive cab by arranging conductors on poles along the track which are charged with high-frequency currents and induce signaling currents in the circuits on the locomotive.

914,808. RAIL BOND; F. H. Daniels, Worcester, Mass. App. filed Oct. 16, 1906. Comprises two telescopic members engaging the rail from opposite sides and having each a flanged head whose inner face is soldered to the rail.

914,816. METHOD OF PREPARING MOLDS FOR ELECTROTYPES; G. E. Dunton, New York, N. Y. App. filed Oct. 30, 1908. Shaves or planes the surfaces of the mold by an electrically heated tool and polishes the shaved surface with another heated tool.

914,837. LINE SUPPORT; J. D. Hilliard, Albany, N. Y. App. filed Nov. 1, 1906. A cheap and easily manufactured means for attaching a line conductor to the insulator by means of a pair of tie wires for each insulator, which are secured to the line wire on opposite sides thereof by clamps. If the insulator breaks or the line breaks, the tie wires hold.

914,856. ELECTROLYTIC APPARATUS; O. Meyer, Richmond, Va. App. filed Feb. 10, 1908. For the electrolytic decomposition of electrolytes, particularly sodium chlorid. The cell consists of a pipe having caps at the ends and a porous pipe arranged therein, a tube in the porous pipe and means for supplying the electrolyte to the tube.

914,868. ELECTRIC ARC LAMP; C. Oliver, Woolwich, England. App. filed July 7, 1905. An electric arc lamp with two magazines, each holding a plurality of carbons which are successively adapted to be fed in place and constitute the electrodes of the lamp.

914,869. ELECTRIC ARC LAMP; C. Oliver, Woolwich, England. App. filed July 1, 1907. Flame arc lamps having two magazines, each adapted to hold a plurality of carbons which are automatically and successively brought into position to act as the electrodes.

914,877. TELEGRAPH REPEATER; G. L. Rawdon, Cleveland, Ohio. App. filed April 30, 1908. Eliminates a number of the parts, including two local circuits and batteries, shown in Patent No. 479,178. Provides a pair of main receiving relays, each having a main magnet and a differential magnet and means whereby the armature of one relay controls directly one coil of the differential magnet of the opposite relay.

914,878. ELECTRIC SWITCH; S. G. Read, Springfield, Mass. App. filed Jan. 20, 1908. For automobiles. Can be quickly removed and replaced so that the operator may take the switch with him and guard against tampering with the machine. A block is provided with a fulcrum pocket, which receives a removable oscillatory switch arm.

914,879. SOUND DAMPER; E. Renz, Erlanger, Germany. App. filed Oct. 23, 1908. For silencing the sounds of electrically acting circuit-breakers by providing a hollow body surrounding the circuit-breaker with a flexible diaphragm which forms a sound-deadening space between the body and the diaphragm.

914,888. ELECTRICALLY HEATED CURLING IRON; B. Y. Snyder, Salt Lake City, Utah. App. filed Jan. 29, 1908. An electrically heated curling iron in which a heating member has a hollow portion, and electrically heating means are located therewithin.

914,891. ELECTRODE FOR ARC LIGHTS; C. P. Steinmetz, Schenectady, N. Y. App. filed Feb. 26, 1902. Made of magnetite so as to give a better light and prevent wasting of the electrode.

914,892. ELECTRIC CURRENT AND VOLTAGE REGULATOR; S. B. Storer, Syracuse, N. Y. App. filed Feb. 6, 1906. For maintaining a predetermined voltage automatically, a differentially wound motor with two opposing windings which are electrically balanced at a predetermined voltage, and which when unbalanced cause the motor to actuate a regulator.

914,939. ELECTRIC ARC LAMP; R. Fleming and C. A. B. Halvorson, Jr., Lynn, Mass. App. filed Dec. 26, 1903. Flaming arc lamps which take care of the fumes that are apt to deposit on the non-consuming electrode. Provides an annular member surrounding one electrode with means for causing movement of the annular member with relation to the axial electrode whereby the axial electrode removes material deposited on the inner periphery of the annular member.

914,941. TRANSFORMER STRUCTURE; C. LeG. Fortescue, Wilkinsburg, Pa. App. filed June 8, 1907. A magnetizable core including a plurality of parallel limbs with cross members joining the same and brackets at the ends, together with clamping means for clamping each core limb concentric with the brackets at the ends.

914,946. METHOD OF WELDING; F. G. Haldy, Stamford, Conn. App. filed July 25, 1908. For welding chain links by pointing one end of the link blank and recessing the other, bringing the points together under pressure and a welding heat.

914,964. IGNITER; J. H. and J. B. Mantion and A. W. Stanley, Hull, Quebec, Canada. App. filed March 18, 1908. Cigar lighter having a receptacle containing wood alcohol with two adjacent but separate electrodes which carry a plurality of torches that can be inserted between the electrodes and dipped into the alcohol and on their withdrawal ignited.

914,972. CONTROLLER FOR ELECTRIC MOTORS; T. S. Perkins, Wilkinsburg, Pa. App. filed March 7, 1904. To prevent sparking at the brushes by inserting, through mechanical means, a resistance in the motor armature circuit when the motor is started, or when from any cause the motor acts temporarily as a generator.

914,975. PORTABLE ELECTRIC LIGHT; G. R. Radley, Milwaukee, Wis. App. filed July 27, 1905. A miniature electric lamp which may be carried by the thumb by means of a suitable ring and which is operated from a battery carried under a coat, the connecting wires passing up through the sleeve of the coat.

914,981. TRANSFORMER; H. B. Smith, Worcester, Mass. App. filed Sept. 4, 1906. The wires of the windings are immersed in insulating fluid and the winding consists of a plurality of substantially cylindrical coils of materially different diameters, each coil having a single layer of convolutions of a strap conductor wound on an edge.

914,995. ELECTRIC CIGAR LIGHTER; J. W. Todd, Jr., Jackson, Miss. App. filed Jan. 8, 1908. A receptacle containing alcohol in which rest the usual brushes of metal. Two metal contact strips receive the electric current and insulating material is packed between the strips. When a brush is drawn across the strips it produces a spark which ignites the alcohol upon the brush.

915,016. ELECTRIC CONTROLLER; F. E. Case, Canton, Ohio. App. filed June 29, 1908. For motors of dental engines having a compound switch and a compound rheostat. The controller comprises a lever and a disk on the same axis, one terminal fixed adjacent to the disk, the other terminal and switch being on the disk. A connection between the lever and the switch throws the switch into contact with one terminal when the lever is rotated and into contact with the other terminal when the disk is rotated.

915,052. ARC LAMP; W. R. Whitney, Boston, Mass. App. filed Nov. 16, 1903. A non-consuming electrode formed out of copper in combination with a negative electrode, which gives a flaming or luminous arc by yielding up the necessary gases to maintain the arc. The negative electrode contains titanium carbon and the like.

915,053. REVERSING SWITCH; J. Dalziel, Derby, England. App. filed April 6, 1907. For dynamos used in train lighting, driven from the carriage axle in which the pawl and ratchet which actuates the reversing switch transmits the movement directly to the switch arm without the use of a connecting rod.